

PB-229 583

PROCEEDINGS. CONFERENCE IN THE MATTER
OF POLLUTION OF THE NAVIGABLE WATERS
OF GALVESTON BAY AND ITS TRIBUTARIES-
TEXAS HELD AT HOUSTON, TEXAS ON JUNE
7, 8, 9, 10, 11, 12, 1971. VOLUME 2

Environmental Protection Agency
Washington, D. C.

12 June 1971

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U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

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A.M. SESSION

9:30 a.m., Wednesday, June 9, 1971

CHAIRMAN STEIN: Let's reconvene.

Mr. Yantis, we will continue with the Texas presentation. Would you continue, sir?

DR. WALTER QUEBEDEAUX, DIRECTOR

HARRIS COUNTY POLLUTION CONTROL DEPARTMENT

PASADENA, TEXAS

DR. QUEBEDEAUX: (Interrupting) Mr. Chairman, may I break in here and ask for a decision?

It is in your realm to issue it. I am under a Federal Court decision as a part of the State organization. And I believe, under your rules, that I do have a right to observe and I would like to make an objection in the record that no more mention be made of Armco Steel, because you have a case in the Justice Department and the EPA and we have too.

You had asked for further comments about Armco, which are not pertinent to this forum. They are in court. They are set for trial. I would like to ask that you rule that any mention of the Armco plant or their activities in the water pollution field be

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declared out of this record and not be allowed to be aired in this hearing.

MR. YANTIS: Mr. Chairman, Dr. Quebedeaux is not an attorney of record in that case.

The representative of the Attorney General of Texas is present; representatives of Armco are present; and the county is represented by the County Attorney's office. I think that matter should be determined by that forum not by this one.

CHAIRMAN STEIN: Sir, let's just have your full name for the record.

DR. QUEBEDEAUX: My name is Walter Quebedeaux. I am Director of the Harris County Pollution Control Department.

Now, when Mr. Yantis starts practicing law, I think he should stand back. But that is beside the point. (Laughter.)

I am responsible for the evidence that goes in in that case, and I don't want it jeopardized.

CHAIRMAN STEIN: I am sure that Mr. Vanderhoof from his side doesn't want his case jeopardized.

DR. QUEBEDEAUX: Now Mr. Allen is here from the Attorney General's office, but he doesn't happen to

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be handling that case. I think, as an attorney, you will recognize that this is not the forum to discuss Armco.

CHAIRMAN STEIN: Sir, I think I can understand your point very well. As I indicated yesterday, I am not here to discuss Armco, nor are any of the Government people going to discuss it in detail, because we are in litigation on that. However, we have a conference here. The conference is open for what anyone may wish to say. I am not inhibiting anyone in his comments in any way whatsoever. I am sure that the State, as has been pointed out by Mr. Yantis, the county, Armco, and all of us are represented by qualified counsel. As a matter of fact, you might consider me among the Government team like that.

I am sure they will have advised themselves, their clients and the people they represent as to what is appropriate for them to say or not to say. The Chair will not inhibit any kind of statements, on anyone's part, on any pertinent subject here they might wish to make. However, the Chair is not going to prompt questions into a case that is under litigation.

DR. QUEBEDEAUX: There are three cases under

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litigation. Mr. Yantis and the Water Board have not joined it officially, although they are reluctant parties by our statute. It is wholly inappropriate for anybody to mention those cases that are under jurisdiction of other courts.

CHAIRMAN STEIN: Sir, I am sure that the lawyers representing all the parties concerned will have made their judgment on that and advised the people they represent, when they come up here, as to what is appropriate or inappropriate for them to say. I think we can proceed on that basis.

Thank you very much.

MR. YANTIS: Is Jerry Coleman in the room?

(No response.)

We had asked Mr. Jerry Coleman to make a presentation on behalf of the Houston-Galveston Area Council. He, in turn, had to check with the president or chairman of that council. And since he is not here at the moment, apparently he has not finished his communications with his own directors. He may be here later and would have a presentation to make.

I have been told that the Harris County

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Commissioners Court or Dr. Quebedeaux would like to make a presentation, and we do propose to provide them time on our schedule at the conclusion of the industrial presentation.

An attorney named Moore wishes to speak on the West Bay and has asked for time. I do not know Mr. Moore. He would have time also to speak on whatever he wishes to speak on at the close of today's presentation by the industrial group.

And the League of Women Voters have asked for time, which we cannot provide this morning. So I think they will be on tomorrow's agenda because -- and you women will understand this -- of some babysitting problems.

This morning we will continue where we left off -- with the beginning of the presentations by industries who were appearing here at the request of the State of Texas. As I introduce Mr. Dave Keck, who will speak as a representative of the Houston Chamber of Commerce Manufacturing Committee, I would like to point out that Mr. Jim Quigley, who does represent U. S. Plywood-Champion, has got to catch a plane. I am sure

D. R. Keck/J. M. Quigley

some of the rest of you have problems like that too. But I would like to ask Mr. Keck if he would do Mr. Quigley the courtesy of letting me call on him first, so that his schedule can be met. He does have some commitments elsewhere.

I must apologize for not inviting all of you to share my coffee, but I am going to be selfish up here and drink coffee while you suffer.

Mr. Keck, will you please come forward?

MR. KECK: Mr. Chairman, conferees, ladies and gentlemen. Due to Mr. Quigley's present schedule, I will let him go ahead of the remarks that I am prepared to make.

Mr. Quigley is here representing U. S. Plywood-Champion Papers, Inc., and he is Vice-President of Environmental Quality, in New York City, for the entire Corporation.

He will be speaking concerning the Champion Papers plant at Pasadena.

Mr. James Quigley.

MR. JAMES M. QUIGLEY
VICE-PRESIDENT, ENVIRONMENTAL QUALITY
U.S. PLYWOOD-CHAMPION PAPERS, INC.
NEW YORK, NEW YORK

J. M. Quigley

MR. QUIGLEY: Thank you, Mr. Keck.

I appreciate the courtesy and the consideration you have extended to me in taking me out of order.

[Mr. Quigley read the following statement in its entirety.]

Mr. Chairman and conferees, my name is James M. Quigley. I am Vice President-Environmental Quality, U. S. Plywood-Champion Papers, Inc. With me are Mr. Richard Wigger and Mr. James Henderson. We appreciate this opportunity to appear before you to detail briefly U. S. Plywood-Champion Papers' water pollution control program at our Pasadena, Texas mill.

This facility is an integrated kraft pulp and paper mill, which produces approximately 900 tons of pulp and 600 tons of high quality paper each day. Chemical pulp is produced by the sulfate process from pine and hardwoods native to East Texas at a rate of 800 tons per day. In addition, some 100 tons of groundwood pulp is produced from pine and cottonwood. These pulps are bleached and converted into a variety of business and printing papers. In these manufacturing

processes, approximately 38 million gallons of water are utilized each day.

The Pasadena Mill employs approximately 1,500 men and women and is located on a 210-acre tract situated on the south side of the Houston Ship Channel immediately adjacent to Washburn Tunnel, which is some 20 miles from the point where the Ship Channel enters Galveston Bay.

The Pasadena Mill started operations in 1937. From the beginning, all of the Mill's liquid waste was given primary treatment.

In December 1965, the Texas Water Quality Board enacted Order 65-9 setting water quality and effluent standards for the Houston Ship Channel-Galveston Bay area. Immediately thereafter, in February 1966, U. S. Plywood-Champion Papers retained Roy F. Weston, Inc. to evaluate the existing waste treatment facilities at our Pasadena Mill and to make recommendations for the upgrading and modernization of these facilities to meet the new requirements inherent in Order No. 65-9.

Subsequently, U. S. Plywood-Champion applied for and received from the Texas Water Quality Board an interim permit to continue to discharge its

effluent into the Houston Ship Channel. The Board's interlocutory order, dated May 15, 1967, required the Pasadena Mill to comply with effluent quality objectives set forth in the table herein.

Permit No. 00640
Pasadena Mill

Item	NOT TO EXCEED		
	Monthly Average	24-Hour Daily Composite	Individual Sample
ph	5.5-8.5	5.0-9.0	4.5-10.5
Total Residue, mg/l	5000	6500	7500
Total Suspended Solids, mg/l	100	125	150
Volatile Suspended Solids, mg/l	90	110	135
Settleable Matter, mg/l	50	62	75
Immediate Oxygen Demand, mg/l	2.0	3.0	4.0
Biochemical Oxygen Demand, mg/l	50	60	75
Chemical Oxygen Demand, mg/l	400	500	600
Oil and Grease, mg/l	25	35	50
Free or Floating Oil	None	None	None
Color, APHA Units	In accordance with current good waste treatment practices		
Temperature, °F	110	120	130
Debris	None	None	None

The water quality parameters in our permit could be achieved only through the construction of the most modern secondary wastewater treatment facility. Unfortunately from our point of view, the Weston study made it clear that we lacked the real estate to build such a facility on our already crowded Pasadena Mill site. This lead to the ultimate decision to design and build a new primary treatment plant to replace the

existing one. The new more efficient and compact primary plant was built at a cost of approximately \$3 million and was completed in August 1969. It occupies about 3 acres in contrast to the 9 acres consumed by the primary treatment facility it replaced. The 6 acres thus salvaged provide the site for the needed secondary treatment plant.

The actual design of the secondary wastewater treatment plant was undertaken and completed while the new primary plant was being built. Construction of the secondary plant was begun in November of 1969 and completed in March of this year at a cost of approximately \$6 million.

I believe, Mr. Chairman, we can most graphically demonstrate our experience since the start-up of the secondary facility by referring to a series of charts. Charts No. 1 and No. 2 show average monthly values for certain effluent characteristics. The time frame covered is from June 1970 to June 1, 1971. Chart No. 3 shows average weekly values for certain effluent characteristics from the first week in February 1971 to June 1, 1971. The bars in the right column indicate permit values. Commencing with the

start-up of the new facilities in March 1971, we experienced an immediate and substantial improvement in the quality of our mill discharge to the Houston Ship Channel in several particulars; namely, reduced concentration of BOD and COD. As we have proceeded with our efforts to stabilize the biological process, we have experienced some radical fluctuations in certain parameters dealing with solids concentration. In one area, that of settleable matter, we have actually experienced an overall increase. This latter result is indeed regrettable and we hope that it will be temporary. We are now conducting extensive experimentation involving the use of polymers and this appears to hold promise of a solution to this particular problem.

With regard to oil and grease, even before we went to secondary treatment, we have on most occasions been within the limit which will be imposed by our new permit to be effective on June 15, 1971. For the 10 months prior to April of this year, for example, we averaged 21 mg/l and with secondary treatment we have cut this average monthly figure by more than half. There have been days in fact in the last month when the oil and grease in our effluent

measured 1 or 2 mg/l.

It is clear from these charts that on May 31 we had not resolved all of our problems; however, we are reasonably optimistic that we will be in full compliance with our permit by June 15, 1971.

In addition to the criteria which have to be met under the terms of our interlocutory permit, we are required to meet the Texas Water Quality Board Order of August 28, 1970, concerning hazardous metals.

That order set standards for the amount of heavy metals which may be present in waste discharges into the inland and tidal waters of the State. Our mill at Pasadena is located on tidal waters and although the tidal water criteria are less stringent in some instances, I am pleased to be able to report that in every instance our mill effluent meets or exceeds the freshwater hazardous metal standards.

Mr. Chairman, there are two additional points I would like to make -- one has to do with sanitary waste and the other deals with the color of our effluent. None of the approximately 38 million gallons being discharged daily from the Pasadena Mill contains any sanitary sewage. In 1967 we entered into an agreement with the city of Pasadena to treat such

wastes from the Pasadena Mill. Subsequently, U. S. Plywood-Champion Papers installed a collection and conveyance system to deliver all of its sanitary wastes to the Pasadena municipal treatment plant which is located just south of the mill site.

With regard to the subject of color, permit me to comment on Recommendation No. 9 in the EPA's March report on Pollution Affecting Shellfish Harvesting in Galveston Bay. On Page 13 of that report, Recommendation 9 reads as follows:

"9) Color of the waste effluent from U. S. Plywood-Champion Paper Company and Southland Paper Mills be reduced to natural background occurring in uncontaminated area waters."

First, I am not certain I understand what that recommendation means. Should the conferees give serious consideration to adopting any recommendation having to do with the color of our mill effluent, we would appreciate having a more precise target to aim at than something as vague as "the natural background occurring in uncontaminated area waters."

U. S. Plywood-Champion does not have a major color problem at our Pasadena Mill as that problem is usually thought of in terms of kraft mill effluent.

As shown on Chart No. 1, our color is in the 450 mg/l range. Kraft mill color is usually measured in excess of 1,000 mg/l.

The apparent color problem we are presently experiencing, in our opinion, is the direct result of the high concentration of suspended solids in the effluent from our secondary treatment plant. As indicated, we are endeavoring to solve this problem and will continue to do so. In this connection, I would point out that the suspended solids is a problem we must solve in order to meet the terms of our Texas permit. When we solve the suspended solids problem, hopefully we will substantially improve the appearance of our mill effluent as it enters the Houston Ship Channel. If this is not the case, we will continue to pursue ways of enhancing the aesthetic aspects of our otherwise high quality discharge into the channel. However, using any and all technology that I am aware of, we are not likely to be able to reduce the color of our effluent to the point where it will approach the "natural background occurring in uncontaminated area waters."

Finally, I would suggest to the conferees that before you make any final decision on Recommendation

No. 9 that you give serious consideration to the call of this conference. When you do, Recommendation No. 9, it seems to me, is something of a well meaning non sequitur. Is there really any connection between the color of our mill effluent and shellfish growth and harvesting in Galveston Bay? (Laughter.) We are not asking you to demonstrate such a causal relationship before we do everything in our power to reduce the color in our treated waste discharge. You, however, might very well want to have such a causal connection demonstrated before you recommend to Mr. Ruckelshaus that the way to bring back shellfish in Galveston Bay is to have U. S. Plywood-Champion Papers and Southland Paper change the color of its effluent 10 and 20 miles upstream.

If I may be permitted to conclude with a few observations, I would do so by noting that the steps U. S. Plywood-Champion Papers has taken to date to bring our Pasadena Mill into compliance with the Texas water quality standards for the Houston Ship Channel required a capital expenditure of approximately \$9 million. In addition, our operation costs to run these treatment plants effectively will be at least \$2-1/4 million a year or some \$6,200 per day. These costs could run

considerably higher, depending on the amount of polymers needed to solve the as yet unsolved solids problem.

Secondly, I would observe that despite this effort we are not yet in full compliance with the Texas standard. We hope to be by June 15. We intend to be in any event.

Finally, I would note that even as we make this big effort to meet current water standards, we are ever mindful that in the future State standards will be even more stringent. We also intend to meet these standards.

Quite frankly, we think our chances of meeting these yet undetermined standards are substantially better as we approach them collectively rather than by trying to "go it" alone. For this reason, U. S. Plywood-Champion Papers is an active participant in and has underwritten a substantial part of the cost to date of studies being made by the Gulf Coast Waste Disposal Authority. These studies relate to the feasibility of a combined industrial wastewater treatment facility. It is my deep personal conviction that if there is a place in the United States where the river basin approach to pollution control can be effectively applied, it is in the Houston Ship Channel-Galveston Bay

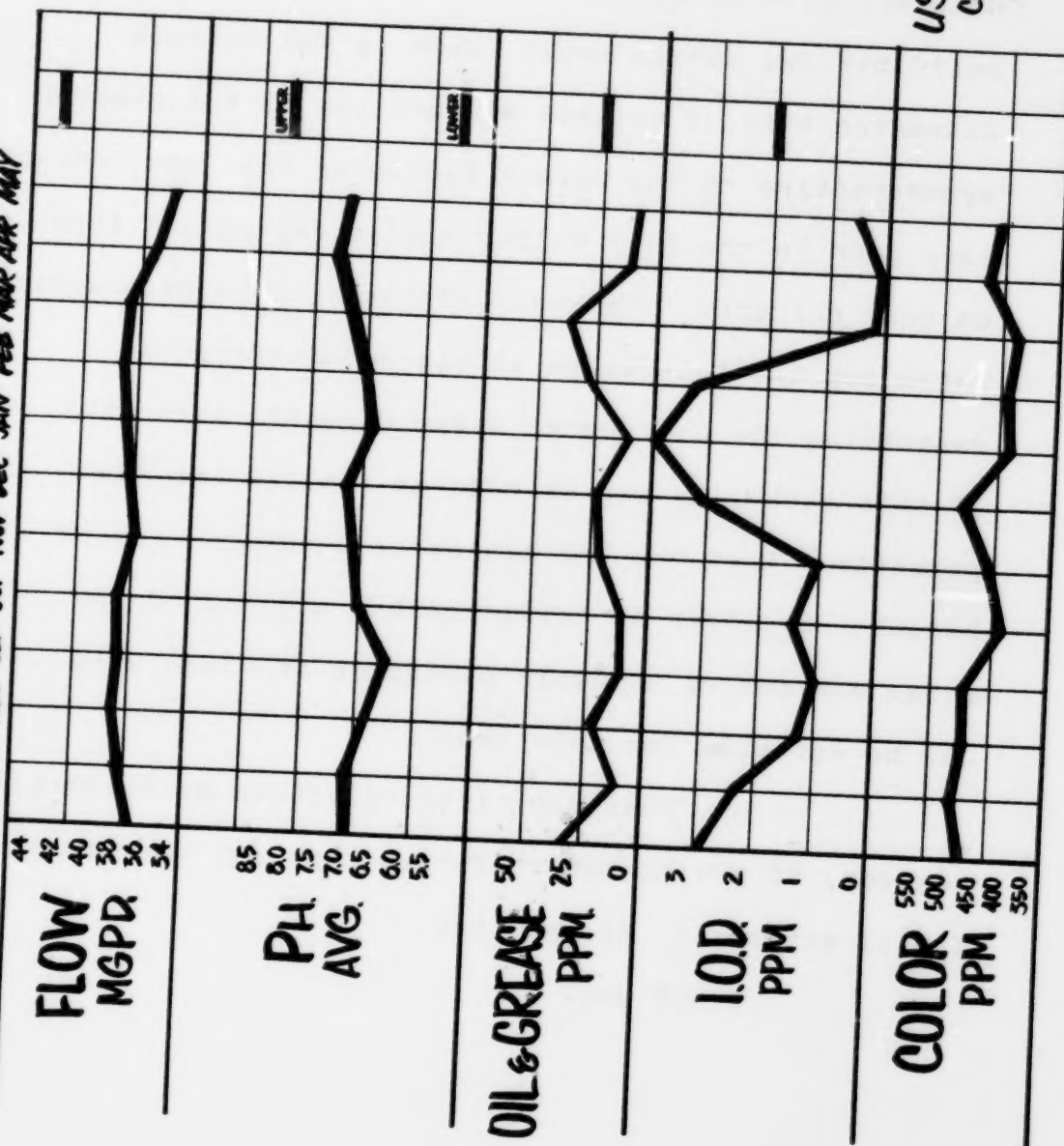
area. It is also my hope that these studies will prove technically and economically feasible. In this area, it makes no more sense for each industry and each municipality to build its own treatment plant than it does for each homeowner in an urban development to build his own septic tank. Here in the Houston-Galveston area, I believe we have one of the greater opportunities to not merely duplicate what the Germans have done in the Ruhr Valley but to expand and improve on that concept. The State of Texas is to be congratulated for the initiative it has demonstrated in supporting the Gulf Coast Waste Disposal Authority. If this authority can be made to realize its full potential, then the harvesting of a bumper crop of healthy shellfish in Galveston Bay and all of the other sources of economic blessings of clean water can be effected for this area.

Mr. Chairman, this concludes my remarks; however, if you or the conferees have any questions, I will attempt to answer them.

Thank you.

EFFLUENT CHARACTERISTICS / CHART NO. 1

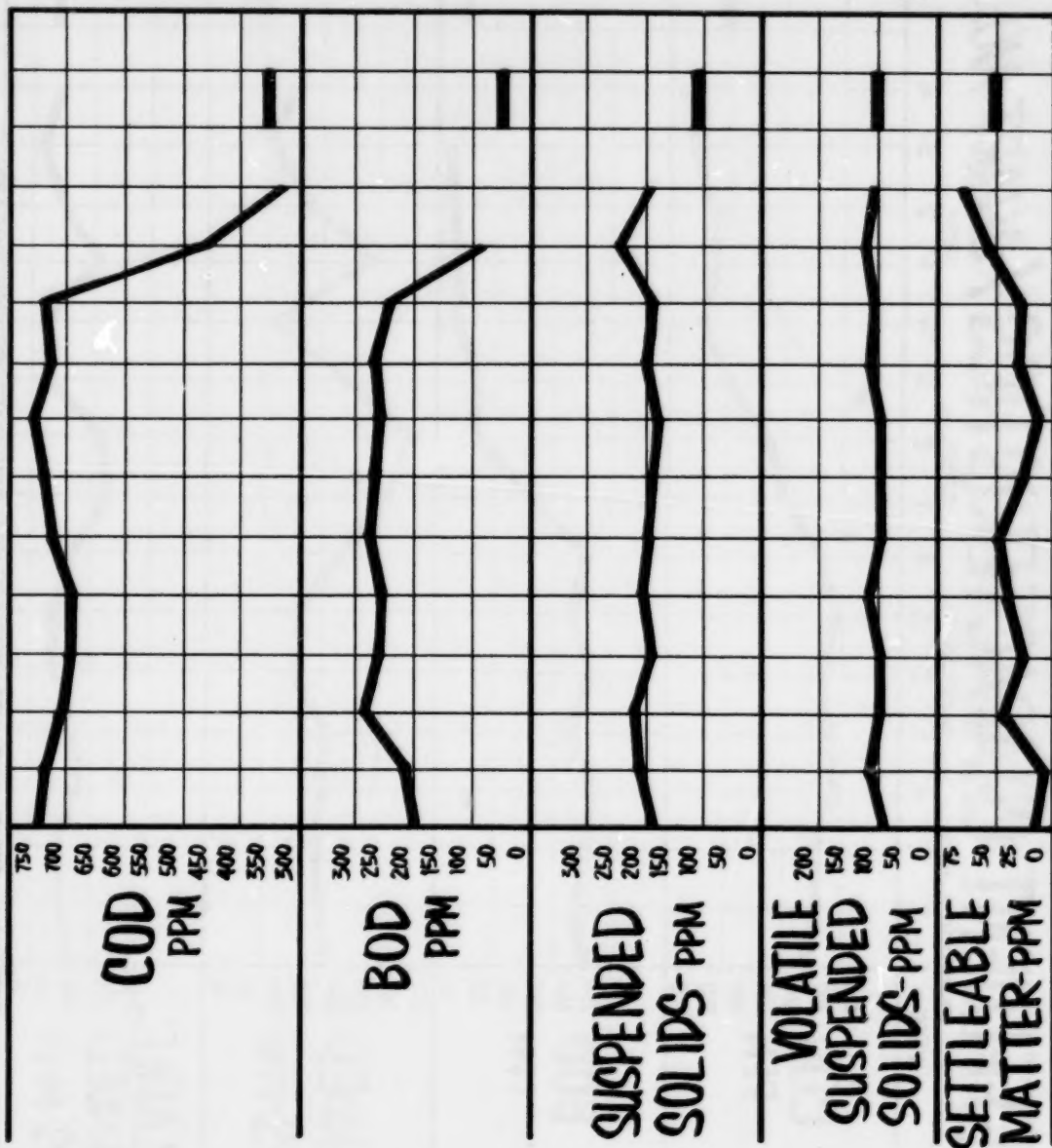
MONTH — 1970 JUNE JULY AUG SEP OCT NOV DEC JAN FEB MAR APR MAY



US PLYWOOD-
CHAMPION PAPERS
PASADENA MILL

EFFLUENT CHARACTERISTICS / CHART NO. 2

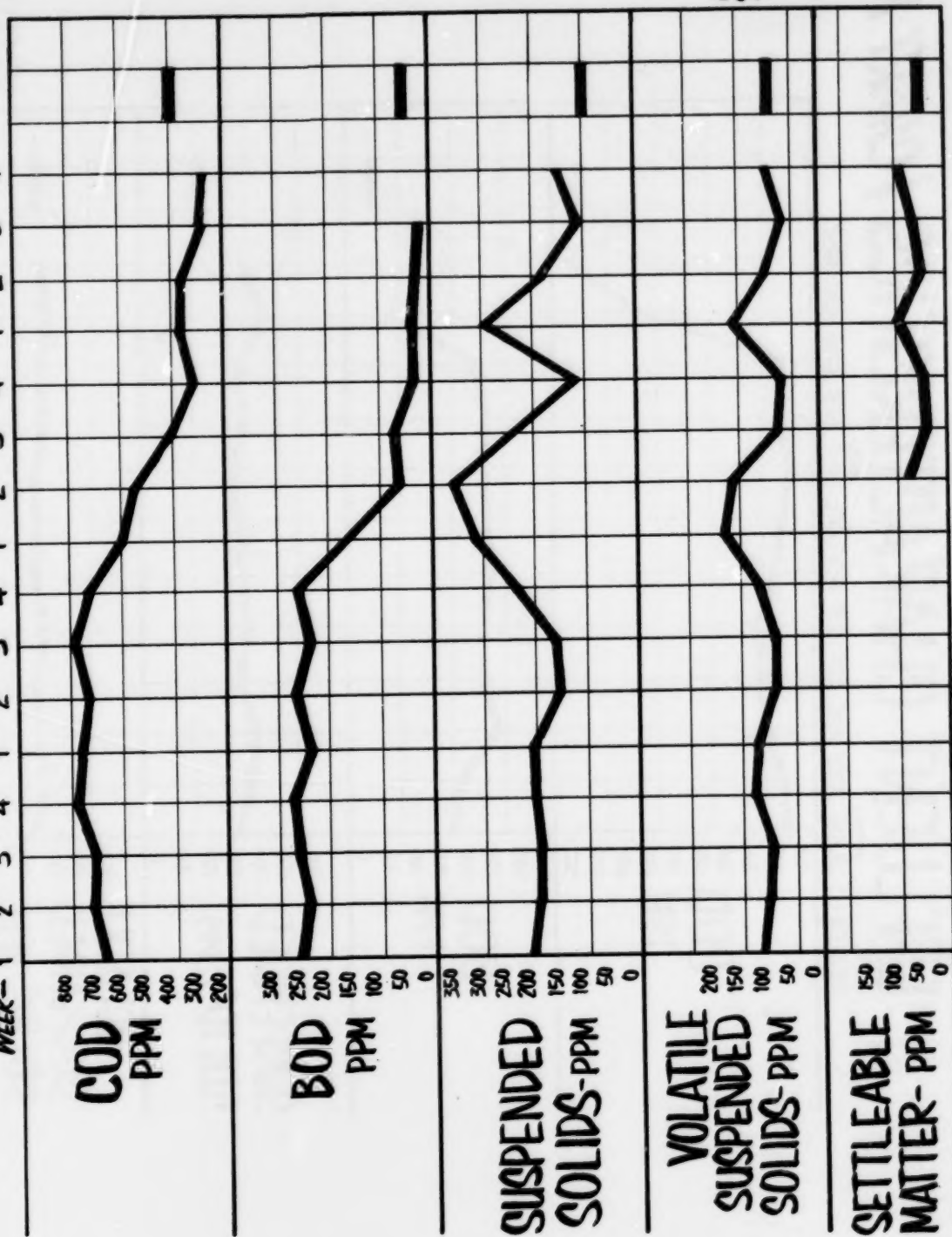
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US PLYWOOD-
CHAMPION PAPERS
PASADENA MILL

EFFLUENT CHARACTERISTICS / CHART NO. 3

WEEK - 1 2 3 4 1 2 3 4 1 2 3 4
 FEBRUARY 1971 MARCH APRIL MAY



US PLYWOOD-
 CUMBERLAND PAPERS
 PLEASANTON, CALIF.

J. M. Quigley

MR. YANTIS: Mr. Quigley, I have one question and, perhaps, one comment. The comment first.

Is it likely that the oil increase in your effluents is actually not oil or grease but is the lignins extractability that comes out of the wood itself in the process?

MR. QUIGLEY: Mr. Yantis, it is highly likely that this is the case.

There are in wood certain lignins, certain other qualities, materials that can in many tests show up as grease or oil.

I think the fact that, since we went to secondary treatment, we have experienced such a favorable decrease in what was our oil increase situation is reflected in the fact that many of these apparent oils and greases are readily biodegradable and are effectively disposed of through the use of the secondary treatment process.

MR. YANTIS: My question -- because I would not have the public feel that nothing is being done to get rid of the problem is: Would you say there is similar research, some of which is federally supported,

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throughout the industry on color removal techniques?

MR. QUIGLEY: As Mr. Stein knows only full well, there are a number of research projects that are being sponsored by what I used to know as F.W.P.C.A., but it keeps changing its name -- and, well, it just keeps changing its name.

(Laughter.)

Several of these research projects do involve a number of paper companies that are dealing with this difficult, annoying, aesthetically offensive problem of color. They involve for the most part the massive lime treatment.

As I indicated, I don't think this is the kind of problem that is bothering us at the Pasadena mill at the moment. We are convinced that it is coming from the presence of the very extensive amount of very small fines. And if we can through the use of polymers or some other technique get these to settle out, then in the process, we will not only lick the suspended solids problem but, in doing so, substantially improve the color of our mill effluent.

MR. YANTIS: One last comment and I think

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Mr. Vanderhoof has one.

Government -- State government too -- has a tendency to speak in initials. There are a group of test analyses, some of which you have up there -- COD, BOD -- and there are others -- TOC, TC, TOD -- COD chemical oxygen demand, is a measure of the organic contents of a waste as it is determined in a chemical laboratory by, in effect, boiling the material in the strong oxidizing acid, and then making certain measurements. It is expensive and it is a little bit slow in that it takes about half a day to run one of them. It is most inaccurate in salt water. There are some corrections that can be made, but they are not very good.

BOD, biochemical oxygen demand, in effect, tries to do the same thing but it doesn't measure the same things exactly.

It does use living bacteria and they are subject to all sorts of inaccuracies and interferences, including being killed by something in the waste.

So, a BOD test isn't very good either, though it is one of the best tests. But it takes a

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week to do it and it is pretty expensive.

There are some modern tests, TOC (total organic carbon); TC-- just total carbon -- whether it is organic or ordinary; TOD (total oxygen demand), which measures some things in addition to carbon.

Now these, once you get a first cost out of the way, can be run in a matter of seconds at a very low expense, and they are much more modern tests, much better tests although they are different.

BOD tells you a few things that TOC doesn't, but the trend should be toward the modern method of analysis.

So, Mr. Quigley, what I was leading up to is that I have spoken to most of the industries along the channel in the last year or 2 about the advantages of going to modern methods of instrumentation analysis. Does your company share my feeling that it would be a step forward if we did this?

MR. QUIGLEY: I not only think it is a step forward, I think it is a step that has to be taken sooner or later and preferably sooner

Again, I would come back to what you know only too well is a favorite subject of mine. It occurs

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to me that the kind of investment that this sort of monitoring and testing equipment will take could very well be best made by an instrument, such as the Gulf Coast Waste Disposal Authority; so that each of the many industrial plants and the municipalities in the Houston Ship Channel might not have to duplicate this expensive equipment and expensive laboratory and test facility.

I think this is just an example of the kind of economy scale that can be achieved and efficiencies that could be achieved, through the use of a collective approach, rather than everybody doing as we have been doing up until now everywhere -- just trying to go it alone. This is doing it the hard way.

CHAIRMAN STEIN: Mr. Quigley, I would like to expand on that comment. As you have seen the past few days, we have had a conflict as to a factual approach. In fact, I have come to the judgement that if we are going to get an accurate report as to what industry and municipalities are doing and be able to hold them accountable, we are going to have to probably have a little black box, checked by a public agency, in

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every municipality and industry -- the same way that we have a meter for our water, gas, electricity and telephone.

However, in this instance, it will be more complex, and I agree with you on the notion that if you could have a public agency doing this, we would be somewhat more --

MR. YANTIS: Let me suggest we use a little white box; the term "black box" isn't very good.

CHAIRMAN STEIN: Well, you used black paper; I wanted to keep it color-coordinated.

(Laughter.)

MR. QUIGLEY: We are the manufacturer of white paper. We pride ourselves on the whiteness, and I have been a little bothered by the terminology that has cropped up in this conference. (Laughter.) Murray, if I could make a comment, I think it is important that the public understand your use of the term "public agency," particularly as it would apply to an agency such as the Gulf Coast Waste Authority, which is a public authority which General Hatch indicated yesterday has all sorts of powers of eminent domain

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and is a potential taxing authority. But the costs of doing what needs to be done is borne by the polluter.

CHAIRMAN STEIN: Well, it should be borne by the discharger and that is why I used that analogy. If you think that an electricity user is not paying for the cost of his meters --

MR. QUIGLEY: And the cost of the pollution control that the utility company has to engage in.

CHAIRMAN STEIN: That is right. This is the point. The cost will have to be borne by the people who are being measured, even though the taking of the readings may be under the control of a public body. If we accept that we can make tremendous advances.

As I see your presentation, I think that you are making certain, within the limits of the technology, conscientious efforts to meet the requirements of the permit. The question is that our technical staff will have to evaluate the nature of the permit.

But I would like to get back to one point. Since it is taking so much time on the color, it is a peripheral one.

Before I get into that, you know Jim Quigley used to be my boss, and I knew the time would come if we

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both lived long enough I would find him over there
(indicating other side of table.)

(Laughter.)

MR. QUIGLEY: I am not so sure I don't
dread the moment, but go ahead.

(Laughter.)

CHAIRMAN STEIN: This isn't "dreading the
moment." You know, considering that he had brainpower
like mine and other fellows to deal with, I knew you
were going to specialize in wood, even when you were
working with the government. (Laughter.)

But, obviously, your colors remain kind
of constant.

Now, I have had visits in the past month
or 2 from the people in other paper industries. They
say that they essentially have the color problem
licked. I don't know how true this is or how
applicable that would be to a particular situation.
But evidently several of the people claim that the
technique of removing color is effective and
economically viable now.

I think you raised one point that I can't
understand. You made two statements in your prepared

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statement. One said that we were vague, and you didn't know what "natural background" meant, and the next time you said under "available technology" you didn't know whether you could meet "natural background."

Now, the point is, if you don't know what we mean, how do you know whether you can meet it or not? (Laughter.)

I can't understand this. I think what needs to be done, when we talk particularly in terms of a relatively new requirement, is that if we are going to require it, we have to get an agreement among the technical staff as to precisely what we mean in terms of a number that we can all understand.

Then, if we are working or headed toward a reasonable cost, we have to be able to understand the technology available before we can really come to an agreement with the State or you.

The reason I take this color issue up is not to take it out of context, but I suspect that this same kind of approach may be applicable to a good many issues where there may be apparent contradictions or differences of views that are developing in this conference.

J. M. Quigley

MR. QUIGLEY: Well, on the question of color, Murray, as you recall only too well, when the Federal Government in 1965, 1966, 1967, went through the effort of trying to have the States set water quality standards, and, if the truth were known -- and I don't object to it being known now -- we kind of finessed the color standard questions. We did this at that time for two reasons. One, we frankly didn't know how to set forth a standard. My criticism of Recommendation 9, I think, is valid. If you were to put me on the spot and say, "How would you recast it," I would have difficulty doing it. It is difficult to state a color standard in specific numeric terms.

The second reason we went over it kind of lightly 4 or 5 years ago is, even if we could have intelligently stated a standard at that particular point in time, we were fairly confident that there was no technology that was technically, economically feasible.

I think in the intervening years there have been developments which indicate things can be done to reduce kraft mill color effluent.

J. M. Quigley

One of the possible solutions, maybe one of the more promising solutions, is the massive lime treatment. But I think it is inherent, and one of my statements is, that one of the dilemmas we are faced with is we don't have the acreage for massive lime or massive anything else. So we are seeking a compact solution through polymers or whatever as we just don't have the space to put any big pond or any massive lime field in.

CHAIRMAN STEIN: All right. Do you have anything?

MR. VANDERHOOF: Yes, I do, Mr. Chairman. I do appreciate very much the paper that you have presented, Mr. Quigley. We are concerned here not only with oysters but also with water quality standards.

On Page 2, you refer to effluent quality objectives, and I am sure that you recognize that standards and objectives are two different things. And you have also by your paper opened up, I think, one of the purposes of the conference -- to inquire deeper into this problem.

I do apologize. I didn't walk out on you;

J. M. Quigley

I would never do that to you. But we had to make a quick calculation for the purpose of understanding magnitudes and flow at your plant, and I understand it is somewhere around 35 MGD.

MR. QUIGLEY: Well, it is running about that now, because of the drouth and the water situation. We are tightening up as much as possible, but I think 38 MGD would be a more typical figure.

MR. VANDERHOOF: And then using the numbers in your permit described on Page 2, and also having observed, as recently as Sunday on the channel, sludge in the bottom to a depth of 2 to 6 feet -- not necessarily from your plant, but from many plants including the city of Houston -- we are concerned.

Do these numbers in the permit relate to the water quality standards set in the channel?

For instance, in the 24 composite on BOD there, if you make the calculation, it is somewhere over 18,000 pounds per day. Now we had reason to believe that the capacity of the channel is not much more than 18,000. So my question then is how does the State intend to meet the standards when we have these very large loads just from one plant? And suspended

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solids are equally large for a 24 hour daily composite, 37,000 pounds per day. And I think at this point we are really getting into the total issue of inquiring into the problem.

Do the permits --

CHAIRMAN STEIN: By the way, is that a question to ask Mr. Quigley or the State? I just raise that with you.

I don't want to cut any discussion off, but maybe we should save that question for discussion with the State. I am not sure, Mr. Vanderhoof --

MR. VANDERHOOF: Well, thank you, Mr. Stein.

Then, Mr. Quigley, please treat this then as an observation -- that Champion has a very large allocation, if you please, to the channel and one wonders how standards will be met. Thank you, sir.

MR. QUIGLEY: Well, Mr. Vanderhoof, I think that we have no problem with meeting the gross figures. You don't know what technical difficulties you might run into. But the plant that has been designed and has been put on stream in the past 3 months, I have full confidence that it can meet the

J. M. Quigley

BOD standard that is contained in our permit. And maybe it is imprudent on my part, but it is my personal opinion that the facility that we have there is capable of exceeding that particular standard by a safe margin.

So, at some future date -- and there is no question in my mind but that it will at some future date -- the State of Texas revises downward or makes more stringent the standards in the Houston Ship Channel, I think we are now in a position where we could meet them or at least have a fighting chance of meeting them.

But, as our experience points out, sometimes the best laid plans of mice and men and engineers just don't pan out the way you hope they will.

So I know you were discussing stream standards here yesterday, and I would point out that our engineers advise me that the quality of the effluents going out of our mill right now, you know, are 4, 5 and 6 parts DO.

Now it seems to me that if this kind of thing can be duplicated up and down the channel -- and from what I heard yesterday, steps are being taken that

J. M. Quigley

are moving them in that direction -- I don't see a point in the very distant future where meeting the present or even a tight oxygen standard on the Houston Ship Channel can't and won't be met.

I think the efforts are in the works here at our mill. And at most of the mills I think. And I am optimistic, that in a relatively short period of time you are going to see a substantial improvement in the quality of the water of the Houston Ship Channel.

Now this is important. But quite frankly, the real importance is not the quality of the water in the Houston Ship Channel, which is basically an industrial stream and is going to remain that; the real importance is the impact of the Houston Ship Channel water on the waters of Galveston Bay. That is where water quality is absolutely essential. So the cleaning up of the Houston Ship Channel is, in my judgment, only a means to a much more important end.

MR. VANDERHOOF: I concur, Mr. Quigley.

CHAIRMAN STEIN: Anything else?

MR. YANTIS: Mr. Keck, I would like to

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introduce you again, since you had a very brief tenure at the microphone awhile ago. I would like for you to consider yourself serving as the State Chairman through the presentations by the industries. I think it would be smarter and easier that way, since you have grouped them together under the sponsorship of the Houston Chamber of Commerce. I was wondering -- you might even sit at the table here, if you want to, and use that last microphone if it would be more comfortable. It is up to you.

MR. DAVID R. KECK, CHAIRMAN
THE MANUFACTURERS COMMITTEE
HOUSTON CHAMBER OF COMMERCE
HOUSTON, TEXAS

MR. KECK: Well I will give my address and then sit there. I may as well be in the audience. I am not a part of the conference officially. (Laughter.)

Mr. Chairman, conferees, ladies and gentlemen, I am David R. Keck. I am serving as Chairman of the Manufacturers Committee of the Houston Chamber of Commerce.

The committee was formed in 1963 and it is

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comprised of managers of approximately 100 plants of all types in the Houston area. A subcommittee of the manufacturers committee, the Air and Water Conservation Division, is chaired by one of the plant managers and is comprised of the top environmental engineers of about 20 of the oil and chemical processing, paper and steel industries.

We have continuously given support to water pollution abatement programs. On May 14, 1963, the following statement of position was adopted by the Chamber of Commerce: "The Houston Chamber of Commerce is in complete agreement with the philosophy expressed in the State Water Pollution Control Law (now the Texas Water Quality Act) to preserve 'the greatest possible utility of the waters of the State,' and believes that the Board should, after adequate study and public hearings, adopt water quality objectives for the Houston Ship Channel, its tidal tributaries and Galveston Bay ..."

In 1965, the Manufacturers Committee supported the establishment of effluent standards designed not only to protect Galveston Bay for

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recreation, shellfish, and seafood production but also to improve the quality of the water in the Houston Ship Channel which discharges into Galveston Bay. Order 65-9 of the Texas Water Quality Board established 3 zones with increasingly stringent waste discharge quality requirements between the Houston Ship Channel Turning Basin and the entrance to Galveston Bay. Amended permits were required from all permit holders at that time and substantial investment by almost every company was necessary to effect compliance with Order 65-9. The Manufacturers Committee supported a 1965 plan for a self-reporting system for all industries. Development of the self-reporting procedure required extensive effort by the staff of the Texas Water Quality Board, and the procedure was implemented December 19, 1969. Since June 1970, industries and municipalities in the State of Texas have been required to report information to the Texas Water Quality Board monthly to enable the Water Quality Board to inventory the sources and total pollution loading of the streams and estuaries of the State of Texas. Texas is among the few States to adopt

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self-reporting. We believe this is the most effective pollution control procedure yet devised, surpassing lawsuits and other punitive types of enforcement procedures. Further, this program, combined with the Galveston Bay Study, in progress since 1967, fulfills all of President Nixon's requests in his February 10, 1970, environment message to Congress. President Nixon asked that State and Federal water quality standards be amended to impose precise effluent requirements on all industrial and municipal sources, based on stream assimilative capacity, and utilizing waste loadings. He also asked for collection of existing data to develop effluent inventories. These same suggestions for Texas have been made to this conference. Gentlemen, programs and studies are in progress in Texas today which fulfill all of these suggestions.

While working to supply information to State and local enforcement agencies, and more recently representatives of the Environmental Protection Agency, the industries of the Houston-Galveston Bay area have accelerated efforts and expenditures to reduce water

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pollution of the area. That the efforts have been effective is evidenced by a substantial increase in dissolved oxygen in parts of the Houston Ship Channel above Morgan's Point during the past 2 years and the appearance of fish, crab, and shrimp at Ship Channel water intake stations as far inland as the Manchester area during the past year, after an absence of approximately 10 years.

One of the plants above the San Jacinto Monument, which pumps large volumes of Houston Ship Channel water into the plant for cooling purposes, routinely has had the channel water analyzed for BOD by an independent, professional, analytical laboratory for the past 4 or 5 years. These samples, taken from a large flow of subsurface channel water, probably are more representative of the actual flowing channel than the normal grab sample, regardless of the precautions exercised in the sampling procedure. The BOD, which has been the topic of much discussion during this conference, has shown a 75 percent reduction from the 1967 average through the first 5 months of 1971.

Regardless of the merits of the BOD test in a stream such as the Houston Ship Channel, we believe

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a reduction of this magnitude is significant.

The BOD of the Houston Ship Channel water decreased from an average of 17.5 mg/l or ppm in 1967 to 13.8 ppm in 1968, 6.7 in 1969, 8.3 in 1970 and 4.0 ppm in the first 5 months of 1971, as progressively more treatment was effected by municipalities and industries above this sample point, as required by the Texas Water Quality Board.

The area of Galveston Bay open to oyster harvesting, for whatever reason, has been increased almost yearly for the past 5 years, indicating success of existing programs and improved performance of industrial and municipal treatment plants. Sailboating enthusiasts have commented on the improved appearance of Galveston Bay near Morgan's Point, the entry point of the Houston Ship Channel. These improvements didn't just happen; they are the result of great investments of technical manpower and money by the industries and municipalities of the area. To determine the extent of the industrial effort, a survey was conducted in January of this year by the Air and Water Conservation Division of the Manufacturers Committee to determine

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capital investment, operating cost, and number of employees required to operate water pollution control facilities.

This survey does not include all industries, but the magnitude of the response is sufficient to indicate to everyone that the frequent claims that industry and State and local enforcement groups are doing nothing are completely unfounded. Summation of the data indicates that \$46.2 million had been invested in the Houston Ship Channel-Galveston Bay area by the responding industrial groups through 1968. These facilities required an annual operating expense of \$6.2 million and 110 full-time employees.

In 1969, an additional \$10.6 million were invested. The total annual operating expense rose to \$8.7 million and 205 total people were required to operate and monitor the facilities. In 1970, another \$16.9 million were invested in water pollution control facilities, increasing the annual operating expense to \$12.5 million and the total number of people to 227.

In 1971, the responding companies estimated they will spend \$20,261,000 for more new facilities.

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Operation and monitoring of the additional facilities will bring the annual operating cost for water pollution control facilities to \$14,132,000 and require 255 people.

Summarizing the costs, the responding industries invested \$46.2 million through 1968 and an additional \$47,755,000 during the next 3 years, including 1971 or a total of nearly \$100 million. As you have heard from the Gulf Coast Waste Disposal Authority and will hear from others, effective investments will continue. The magnitude of this investment is positive evidence of the implementation of the programs of the Texas Water Quality Board and Harris County, diligence in enforcing the programs in the Houston-Galveston Bay area, and the complete inaccuracy of the claims that industries in this area are doing nothing to improve the water quality.

The Air and Water Conservation Division has reviewed specific data presented to this conference by the Environmental Protection Agency. Several comments on these data are in order:

1. The data of Table V-4 show that the maximum observed concentrations of heavy metals

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decreased markedly between February 1969, and November 1970. In fact, the data of November 1970 obtained by the FWQA, show heavy metal concentrations lower than that required for drinking water (except chromium as published in U. S. Public Health Drinking Water Standards.

2. The conclusion reached in the EPA report is that the permits issued by the TWQB allow more than 55,000 pounds per day of oil and grease to be discharged into Galveston Bay and its tributaries. This figure was not arrived at by taking the average discharge rate and the average oil content of each permit and converting these to pounds per day. For a situation to exist, which would produce the discharges alleged, all 81 sources would have to be discharging at above permit average rates and concentrations simultaneously, an event which is most improbable. Further, if a permit maximum value is set realistically, it must be considerably above the value that will be averaged. Otherwise, during upsets, power failures, adverse weather conditions, and many other factors that affect a treatment plant adversely, the maximum will be exceeded. The assumption that the maximum values will be approached by all discharges is unwarranted.

In connection with oil contents of effluents, it should be recognized that the TWQB Order No. 65-9 prohibits the discharge of "free or floating oil." The implication that permitted 5.3 mg/l of dissolved oil contributes to oil slicks also is unwarranted.

This method of presenting data and drawing conclusions therefrom places an aura of guilt on bigness itself. It tends to discourage the very thing that has gained sanction by

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most government groups; i. e., large regional waste disposal facilities such as those being promoted by many enforcement agencies throughout the country. By having separate discharges for each industry or municipality, the unwarranted charges of large poundage discharges can be escaped merely because the large volume multiplying factor is absent.

3. The footnotes at the bottom of Table VI-4 reveal that the entire table on heavy metals into the Houston Ship Channel is based on grab samples in early 1969. We wholeheartedly agree with the last sentence which states "additional field data are necessary to determine if the samples collected are representative." We are puzzled that more recent data are not presented since EPA field teams obtained extensive samples of effluents discharged into the Houston Ship Channel early this year. Many improvements in effluents have been made in the last 2-3 years, as shown by analytical data presented to this conference, and as would be expected from the technological effort and dollars invested for pollution abatement. It would appear that EPA should make a more determined effort to present 1971 conditions, not those of early 1969.
4. Apparently Table VI-2-A, which presents waste discharge permit data, was compiled by the State several years ago, and never updated, since many of the listed permits have been cancelled or revised downward in allowable contributions.
5. As a matter of policy, we believe it is incumbent on any enforcement agency to notify a violator of pollution laws immediately anytime its samples indicate hazard to the environment, not to wait until a report is issued later or a public conference is to be held.

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There are many pressure groups in the Houston area, most of them fairly new, formed to try to bring their particular point of view in force on society. Most of these pressure organizations try to achieve their ends through publicity, and most of them direct their fire at the industrial community. There are three main reasons that industry seems to be such a favorite target. First, industry is visible. You can see the factory stack or waste discharge. For some reason, the jobs and other benefits to society, provided by that factory, seem to be less visible. Second, taking it out on industry is easier for some people to do than to look at their own possible obligations and responsibilities in service to society. Third, industry finds itself a target because of the very fact that industry indeed has demonstrated over the years that it does get things accomplished. What could be more natural than for groups in our society, who want to get particular problems solved, to turn to the industrial community for answers? You call on the doers when you want something done.

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Companies represented by the Manufacturers Committee are the doers; they have expressed willingness to cooperate with the Environmental Protection Agency; and so far as can be determined, have worked closely with EPA personnel at all times to provide information on the current quality of discharges from the various industries. The industry of this area has made measurable progress following programs established by the Texas Water Quality Board and local officials.

Further progress can be made with continued cooperative and the added contributions of the EPA effort. We firmly believe that no other area of the country has shown the forward progress during the past 5 years that Texas, and particularly the Houston Ship Channel-Galveston Bay area, has shown in effectiveness of pollution control efforts.

The Manufacturers Committee of the Houston Chamber of Commerce welcomes this opportunity to provide to this conference facts, which indicate that effective pollution abatement programs and investments do exist here. As a Committee, we stand ready to offer the Environmental Protection Agency the same cooperation and compliance with national programs that we have

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provided the State and local programs for pollution abatement.

However, neither the Manufacturers Committee nor the Chamber of Commerce has police powers or enforcement powers, nor does it seek any such powers. It does have internal persuasive powers, and it is through this approach that it seeks to be an effective force in abatement of both water and air pollution.

This organization's concern for the community's well-being resulted in the adoption on October 14, 1969, of a strong statement of policy on air and water conservation by the Board of Directors of the Houston Chamber of Commerce. Because it is a strong statement, and because it does state our position on air and water pollution without equivocation, it is worthy of repeating to this conference:

1. The Houston Chamber of Commerce hereby declares its active support of efforts to conserve and improve the quality of the Houston area's air and water.
2. The Chamber believes responsibility for taking action to accomplish these objectives is shared by individual citizens, business and industry, and by state and local

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governments. It pledges to furnish leadership to the industrial community, support to governmental units, and encouragement to all private citizens to assume their rightful share of the expenditures and efforts required to achieve excellent quality of air and water in Houston.

3. The Chamber believes that effective enforcement of air and water quality laws and regulations is an imperative part of the solution to this problem. The Chamber declares its support of such action, within the limits of necessary time required by companies and communities aggressively to plan and construct facilities to achieve compliance.
4. If at any time it is established that present laws or regulations are inadequate, the Chamber states its intention to support, or sponsor, if necessary, government enactment of measures which will assure clean air and water to the Houston area.
5. Because the combined potential of the individual citizens to degrade air and water quality is so immense and is increasing as Houston grows in numbers and standard of living, the Chamber declares its intention to support responsible bond issues for the purpose of constructing and expanding sewage treatment plants and other public facilities necessary to dispose of the community's wastes.
6. The Chamber believes all these efforts are a rightful assumption by each element in the Houston social structure of its duty to its immediate neighbors, to the community, and to society itself if we are to enjoy the benefits of an environment we hold in trust for future generations of Houstonians.

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Gentlemen, the leadership and accomplishments being demonstrated today by the Chamber of Commerce of Houston, Texas, are merely the realization of the dream of our founders -- reported 114 years ago in the Houston Telegraph, January 21, 1857. We quote:

To make Houston all that we hope and believe it is destined to be and all that present indication foretells that she will be, requires only that our citizens shall continue to operate with the same liberal public spirit and the same far-seeing sagacity for which they are already distinguished. They have only to push forward to completion the great enterprises they have already commenced, and to encourage others of a like character as time and circumstances may show them to be feasible and desirable. They have only to perform well the duty of today and seize the opening opportunities of the morrow, and their prosperity will grow upon them in almost geometrical ratio.

The object of our enterprise has been and is principally to make Houston commercially great. But there is no good reason why this point should not be the center of intelligence and of education as well as of commerce. There is no good reason why this should not be a city of beautiful residences, as well as of extensive warehouses -- a city of fine parks, of wide, clean, and shady streets, of elegant churches and colleges, of spacious temples for the drama and the poets and of all that constitutes a rich and refined community. In the growth of all such cities there are obstacles to be overcome, but what impediment is there in the way of Houston too mighty and vast for us to surmount.

That was written in the year 1857.

Now, with the indulgence of this conference, several of our member industries have prepared statements

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of their individual programs and accomplishments toward overall water quality improvement and preservation of shellfish growth and harvest in Galveston Bay.

Mr. Chairman, do you want to stop here?

CHAIRMAN STEIN: Well, we would like to stop after each speaker and I think you had an expansive talk.

As we announced at the beginning I would like to give the conferees an opportunity to comment or question.

MR. YANTIS: Mr. Chairman, let me make a brief announcement. When we break for coffee -- it is a rest break for the reporter -- I would like to meet with Dr. Nugent Marrack and the students he brought with him. They are mostly down here on the front row.

Then before we get into the industrial presentations, Joe Lagow, the County Commissioner from Chambers County, has got to be back in Chambers County for hurricane warnings and hurricane preparation conferences. That is very important.

I would like for Joe Lagow, as soon as we get through with these questions, to go ahead and make

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what he describes as a "6-minute talk." Then I think he will keep it down to 6 minutes.

Anyhow, after the questions for Joe Lagow, I think it would bring us to the rest break. During the rest break, I would like to meet with Nugent Marrack and the students.

Now go ahead, Mr. Chairman.

CHAIRMAN STEIN: Thank you. Well, we will try to keep up your aim. We are really providing a forum as you point out in Houston for the dramatist and the poet. (Laughter.) (Applause.)

But I would like to comment on the expression that you gave about your belief that the best way that pollution control can be achieved in a cooperative spirit with all levels of government is one we should seize upon. Because the Supreme Court in 1921, I think, in a very complicated pollution case in New York and New Jersey -- and although I looked through my papers and don't have my quotes here; I have read it so many times that I can probably state it verbatim -- said that complicated problems such as that can best be handled by study, mutual concession, and conferences of the States

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concerned than by action in any court, however constituted. This was the Supreme Court of the United States.

Now, the Supreme Court just recently, within the last year, had another case of this type and they quoted this again with approval. So it is still current law. They pointed out again the Federal conference procedure, which we have here, specifically.

Now I know I, for one, do not regard this as a dramatic experience of criticism of anyone when I come here. Maybe some people do. But I say everyone can have his own views. I agree with you, Mr. Keck. We have an opportunity here to work this out in a way that the Supreme Court says it can best be worked out, because I think all parties concerned will find that this is a much better format in which to do that than in any kind of court. We have the opportunity here, and with goodwill on all our parts. I am sure we are going to be able to achieve an objective.

From what you said, your philosophy is certainly commensurate with that. I know you have raised many specific points or questions. Any problems

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or questions you have are questions of detail. Again, I think these details are vital.

Of course, they deal with the real world, with physical facts, with things which may be difficult to determine and measure, but I think it can be done. Again, if we deal as speakers of goodwill, I am sure we will come to an agreed-upon statement of all the details you arrive at and be able to move forward with the program.

MR. KECK: Very good.

CHAIRMAN STEIN: Thank you.

MR. VANDERHOOF: I too concur with the philosophy you just enunciated, but I would observe that the channel speaks for itself.

Sunday, June 6, a party of us did go -- not for the first time, I would observe -- up the channel and we saw evidence of oil spills. I was told there were 6 reported large spills last Wednesday.

The quality of the API separators is questionable, and, therefore, I do take exception to your comment that the 55,000 pounds of oil and grease is not realistic. I believe it is an underestimation.

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As I said, I believe the channel speaks for itself for there were just traces of oxygen in the area from Morgan's Point to Armco. It did keep going down, and somewhere in the vicinity upstream of Armco was a dead area. It was septic. We observed 2 to 6 feet of sludge on the bottom. We observed septic conditions, bubbles rising from the bottom.

I merely point this out -- that we do have a long way to go.

MR. KECK: That is correct.

The channel has been anaerobic in the lower levels of the water and that is where the treatment, in effect, has been occurring during these many years. And this is what has given us (the citizens of Texas) protection of Galveston Bay, because by the time it gets to the bay, the water has been fairly well cleaned. And as the BOD loading is decreased, as you saw yesterday, it has been according to the State figures and according to the measurements that I mentioned, this condition will change. At some point in time -- I don't know when -- the channel will probably become aerobic again instead of anaerobic. But, at the present time, it is recognized that it is anaerobic.

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MR. VANDERHOOF: Mr. Keck, are you also talking for the city of Houston?

MR. KECK: No, sir. I am representing the Houston Chamber of Commerce.

MR. VANDERHOOF: All right. Thank you.

No more questions.

CHAIRMAN STEIN: Any questions?

MR. YANTIS: No.

Before we recess -- and I am sorry we have to have this one more presentation in the sense that it is time for a recess -- but, if the students would stand by to meet with me and Dr. Marrack, we will recess in a moment.

Joe Lagow is the President of the Texas Air and Water Resources Foundation. This is a foundation organized locally. It had a great deal to do with passing Amendment 4. It was organized to represent, as far as it could, the will of the local people on a voluntary association basis.

He is a member of the County Court of Chambers County. I would remind you that nearly all of Galveston Bay and Trinity Bay are in Chambers County,

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and the United States Steel complex is in Chambers County; I believe the Houston Lighting & Power plant will be in Chambers County. It is a growing county of great significance.

I was also thinking here, as I looked at his need in talking about hurricane warnings and hurricane preparations, what would a hurricane do to a major power company, sitting right on the open seacoast, in order to take advantage of ocean disposals if a hurricane came along?

Joe Lagow says he needs 6 minutes. He wishes to give his private thoughts and perhaps those of his Commissioners Court to us. As he concludes, we will break for coffee or rest.

CHAIRMAN STEIN: Thank you.

Let me make one procedural observation now. If any of you come up and you just have 1 copy of your statement or a limited number, the one who has priority is the court reporter because this will alleviate her task. So give your copy to her first, and then we will take a distribution among the panel later.

MR. LAGOW: I have other copies.

J. Lagow

MR. YANTIS: Proceed, please.

MR. JOE LAGOW, PRESIDENT
TEXAS AIR AND WATER RESOURCES FOUNDATION
ANAHUAC, TEXAS

MR. LAGOW: I want to thank you gentlemen for the privilege of coming here and talking here today before this committee.

This is going to be difficult for me to cut this speech down to about 6 minutes as I promised you. I know you all have plenty to do and I could talk here all day if I were allowed to on this subject.

My name is Joe Lagow. I operate a 20,000 acre ranch near Anahuac, and I am a member of the Commissioners Court in Chambers County, which borders Trinity Bay, Galveston Bay, East Bay and the Gulf of Mexico.

I happen to be a graduate of Rice University and also Columbia University, but I still look upon myself as a conservationist. (Laughter.)

I prefer to call myself a practical conservationist. I practice conservation which means I

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project broad programs, on the land over which I exercise authority far into the future, on the protection of our waters, and the development of sanctuaries for fish, bird and animal life. Those of you who know me, know this to be true. Conservation and environmental protection are the measure of our bread and butter. We do not approach it as something for a weekend party, or the pursuit of headlines in the newspapers.

Without conservation and environmental care and restraint, we die -- so we pride ourselves in my locality -- that when we speak on conservation needs we know what we are talking about.

But I stand before you here today in another capacity. What I have said before was intended simply to try to establish that there is an awareness of the necessity for environmental control at the level where the injury, if any, actually occurs.

In appearing here today, I come as President of the Texas Air and Water Resources Foundation. This foundation was established back in 1965, for the purpose of "engaging in activities that would lead to the State's

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air and water improvement, to support use and preservation of air and water resources, and to study waste disposal methods." This singular -- and perhaps unique -- feature about this foundation is that it has been financed entirely with funds privately contributed, upon the premise that the public itself has the major stake in environmental protection -- not necessarily the government.

It is also important to us that our support -- cash support -- has come from broad sections of the public, not just a few isolated contributors.

I am proud to be a resident of coastal Texas, and of Chambers County, and so far I haven't worked up any fear about living down here, working down here, or playing down here. My interests in sports and wildlife have not prejudiced me against others around me, like the industries. I think they have done a good job in helping us to develop our region, and I think they ought to be applauded for it.

My appearance here, therefore, is for the purpose of asking a question. I will make it short. The question will arise out of a statement of fact and

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not out of name-calling.

There is (as has been brought out at this meeting) an organization long active in substantial research studies into the quality of the Galveston Bay and how to improve it. This is the Galveston Bay Studies program. It is an organization set up awhile ago by the Texas Water Quality Board, whose members, incidentally -- and I am glad to assure you personally of this -- also happen to be Texans who, I believe, are just as much interested in the welfare of this area as the rest of us.

To date, that organization, meaning the Galveston Bay Studies group, has been at work for some 4 years. Its efforts so far have cost upwards of \$1.4 million, mostly of State funds. And here I am talking now specifically to you gentlemen from the EPA.

But the Federal Government, through your own organization and through the Corps of Engineers, has also contributed around \$150,000 of the financing to this organization -- the Galveston Bay Studies. But a great deal of this financing came later after much request and delay.

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And the privately-supported foundation which I represent has contributed between \$75,000 and \$100,000 to this effort.

The purpose of the Galveston Bay Studies program was to come up eventually with a report that would propose the basis for a sound management plan for the bay, toward the end that not only would marine and other ecological wildlife be preserved, protected and reproduced, but that the great and culturally beneficial practical resources of the region would not be sacrificed.

Maybe it has been a little slow, but then the support pledged by the Federal Government was held up some time in a way that on occasion seemed destined to destroy the project entirely.

The Galveston Bay Studies program has been supervised by State government engineers and technologists of high repute. And the technical tests, studies, and conclusions have been undertaken by engineers and scientists of national renown -- like Bernard Johnson; Tracor; Nat Turner of Turner, Collie and Braden; and others. This has all been a great help to our Galveston Bay Study.

J. Lagow

In the newspapers of the past Sunday, this meeting was reported to have been called by the Environmental Protection Agency to make, among other things, what could only be interpreted as a sudden -- and I quote -- "...assessment of the waste load that the bay system can handle, with allocations to the individual cities and industries of pro-rated waste quotas 'not to be exceeded regardless of future development.'" And that story said further that "the recommendation would require the Houston area to clean up its waters with progressively better treatment, or to stop growing."

Now the question that I want to ask is this: Precisely what has our money from my foundation -- privately contributed -- been going for? And what has the \$150,000 of Federal money that has been invested in the Galveston Bay Studies actually been going for?

We are not engineers, but we are not exactly novices in the environmental field either.

Are we to understand, from the newspaper statements imputed to you, that your own engineers and technologists, because you happen to be on the Federal

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payroll, are better qualified to come here and in 2 or 3 months -- using data they, in themselves, probably have not even gathered, at least in the last 2 or 3 years -- say that people who have been working at this project for 4 years now don't know what they are talking about? Or that they have been doing nothing useful at all?

Actually from my own observation -- and I live right down there alongside the water that you are talking about -- the bay waters are far better conditioned today than they were even just 5 years ago and vastly cleaner than they were 10 years ago. I do not mean to criticize the good offices of some of our Federal people when they are put to good and useful service. Congressman Eckhardt, for instance, helped very much in saving our oyster beds; and his support did a lot to assure the passage of the pollution bond amendment in the last election, Amendment 4.

But we have already got a lot of privately-raised money riding on the success of the Galveston Bay Studies program. And we need some answers.

And if you do inform us that the studies

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which we have helped to support with hard cash -- and that your organization has been supporting with hard cash -- are faulty and inadequate from engineering and technological standpoints, then this foundation requests that you justify the professional competence of your own engineers to refute such studies.

We want to know whether they are really capable of contesting or even commenting on the professional pronouncements of the experts now long at work on this program. You can be assured that if we have put our dough on the wrong horse down here, we don't want to continue to throw good money after bad.

But, so far we have had confidence in the engineers working daily on this problem back over the past 4 years. These people are in the main private citizens whose talent and ability have to be of the highest caliber, or they couldn't make a living at this game. We haven't been provided with anything yet, except maybe the imputations that anyone else is capable of doing the ultimate job of cleaning up the Galveston Bay better than the people who have been working on it.

We would like to hear what our own engineers

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have to say about this proposition of cleaning up the Galveston Bay overnight. May we ask that you call on them and talk to them if they are here today?

(Applause.)

MR. VANDERHOOF: Mr. Lagow, I would point out to you that the Galveston Bay funds from the Federal Government are significantly greater than your \$150,000. My figures here indicate about \$630,000 broken down as follows if you wish:

Corps of Engineers, \$300,000; the Estuarine Study Socio-Economic, \$50,000; a laboratory contract to analyze the samples collected by the Corps of Engineers, \$100,000; and research and development projects conducted by Dr. Roy Hahn, \$110,000; the cost of our Houston office, \$70,000; Total, \$630,000.

Now, you also referred to our impeding programs by holding up funds for the 3 projects. I would point out to you that there was an issue of a conflict of interest clause that took much time. It has now been resolved. With respect to that you are quite capable of doing the job solely by yourself. I will again point out that the channel and the bay speak for themselves.

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I have already described the channel, but I have not yet heard any words from anybody on this massive fish kill that was going on during the month of May.

You ask, "Are we capable of contesting decisions of the local people?" I believe we do have many questions. Thank you.

MR. LAGOW: May I make a statement about some of those fish kills, please, sir?

CHAIRMAN STEIN: Surely.

MR. LAGOW: I happened to be on the investigation of one of those fish kills on our side of the county. And it turned out to be that a barge was pumping out bilge water into the bay and into the channel which killed these fish, and that was done at night by some person employed by someone, and that information was never disclosed as to who gave the order.

But we do know that it was done by a person, and it was given to us by an individual that was thoroughly aware of what was going on. And those things are going to happen regardless, because there are people

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taking orders from somebody else or else taking it upon themselves to do so.

It is nothing unusual because we have had that same thing happen in the Intracoastal Canal last year that killed many millions of fish. Some fish, redfish, that went up to 30 pounds. I mean 30 pounds in size. And, flounder up to 8. And also the other good food fish besides the menhaden and the mullets and shad, etc.

But I am sorry about my criticism there on the financing because I only have the information that had been given to me, and I do know that this conflict or interest occurred right here in town and we know the persons behind it.

But we feel like that has been overcome, and we certainly appreciate the privilege of being here today. Thank you.

CHAIRMAN STEIN: Thank you.

MR. YANTIS: Well, Joe, thank you for keeping all of that under 6 minutes. I thought you did marvelously well. (Laughter.)

MR. YANTIS: We will break for the rest-break,

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recess, or what-have-you.

(Whereupon, the conference recessed.)

CHAIRMAN STEIN: Will you take your seats, please? Will you please sit down?

There have been numerous inquiries about how long we are going to hold the conference. I think I announced in my opening remarks that we were here to listen to everyone who believed he had something relevant to say. From the looks of things, we are going through tomorrow at least. We are checking where we will meet tomorrow. Hopefully it will be right here, but we will give you a definite announcement later.

Mr. Yantis?

MR. YANTIS: Mr. Keck, will you proceed, please?

MR. KECK: Yes, sir. Our next speaker represents the Diamond Shamrock Chemical Corporation.

He is Mr. R. C. Sutter, Vice-President of Engineering from Cleveland, Ohio.

Mr. Bob Sutter.

R. C. Sutter

MR. R. C. SUTTER

VICE-PRESIDENT, ENGINEERING AND CONSTRUCTION

DIAMOND SHAMROCK CHEMICAL COMPANY

CLEVELAND, OHIO

MR. SUTTER: Mr. Chairman, conferees, ladies and gentlemen. As Mr. Keck said, my name is R. C. Sutter. I am Vice-President, Engineering and Construction, Diamond Shamrock Chemical Company, Cleveland, Ohio. Diamond has 3 plants in the Houston Ship Channel area, but my comments will refer specifically to our Deer Park Works, which is located on the Houston Ship Channel approximately 1-1/2 miles west of the San Jacinto Battleground. This plant has been indicted in various newspaper stories across the Nation and in the Environmental Protection Agency report on pollution in Galveston Bay as one of the worst polluters in the area.

We were mystified when newspaper reports began to appear in April and May of this year, labeling Diamond's Deer Park Works as one of the worst polluters on the Houston Ship Channel. Our own analysis of the situation indicated that this statement was not true. No serious complaints had been made to us by any

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regulatory agencies -- county, State or Federal -- and we were in compliance with all established water quality standards. Furthermore, in those areas where there is any question as to our ability to consistently meet established or proposed water quality standards, we are engaged in designing and installing additional and improved treatment facilities.

It soon became apparent that the source of the newspaper stories indicting Diamond Shamrock's plant as being, we quote, "one of the worst polluters" was a report prepared by the Water Quality Office of the Environmental Protection Agency, Division of Field Investigation, Denver and South Central Region, dated March 1971, which was to serve as the basis of the Federal technical presentation at the Galveston Bay Enforcement Conference called by Mr. Ruckelshaus for June 7, 1971. Finally, on May 24, 1971, we received from the Regional Office of EPA a copy of the report titled, "Pollution Affecting Shellfish Harvesting in Galveston Bay, Texas," dated March 1971. We were amazed to find upon reading the report that the basic data used were Federal analyses of grab samples taken

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by the Texas Water Quality Board in February 1969. We were not informed of the results of these analyses until April 1971, and we do not know why these analyses were used when more thorough and complete samples of our effluent were taken by State and Federal agencies in July and October of 1970, and February and April of 1971.

We seriously question the accuracy of these February 1969 analyses. Had we been advised of the analyses at the time we probably could have reconciled what now appears to be irreconcilable differences between the February 1969 analyses and the samples taken later. Some of the metal analyses of the February 1969 grab samples are as much as 70 times greater than the later analyses.

Assuming the validity of establishing a major position on pollution on grab samples taken more than 2 years ago, the more serious error in the report is the failure to recognize the fact that most of the discharge from Diamond's Deer Park Works is Houston Ship Channel water used in the plant for once-through cooling.

Our plant is probably unique on the channel

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in that it was designed at its inception in the mid-1940's to use the brackish channel water for cooling. To our knowledge, the only other plant along the channel that uses Ship Channel water in this fashion is the electric power generation station of Houston Lighting & Power. The decision to use channel water for cooling requires more expensive materials of construction and more careful attention to design, but it does result in the conservation of a limited supply of underground freshwater. Subsidence in the area over the years has demonstrated the consequences of uncontrolled pumping of this valuable resource.

About 95 percent of the approximately 150 MGD identified in the EPA report as waste discharge from the Deer Park Works is actually, in fact, once-through cooling water pumped from the channel and returned directly back to the channel without change except for temperature. By not taking into account the analysis of the channel water pumped into the plant, a gross error is made in the calculations of industrial wastes originating from Diamond's Deer Park Works. Diamond's Deer Park Works produces chlorine, caustic,

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polyvinyl-chloride resin, acetylene, and chlorinated solvents. No oils and greases are produced or processed, and no heavy metals with the exception of mercury are processed or used in any of the processes. There would be no reason to believe, therefore, that Diamond's Deer Park Works would be responsible for the discharge of any oil and grease or heavy metals with the exception of mercury. A careful material balance between incoming channel water and our various outfalls shows this to be the case; that is, no oil and grease or heavy metals are added to the channel by the Deer Park Works. Yet, the EPA report shows, for example, 1,420 pounds per day of lead discharged by Diamond into the channel, which, incidentally, is 87 percent of the total lead claimed to be discharged into the channel, which brings into question the conclusions of the entire report insofar as it applies to channel industry, since the industry named as the major source of pollution, Diamond's Deer Park Works, is not a source of pollution at all insofar as heavy metals and oil and grease are concerned. The same errors, of course, exist in all other

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calculations of the various recognized pollutants in the channel.

I would like to call your attention to an interesting mathematical fact: One part per million (1 ppm) of any pollutant in approximately 150 MGD of water (our permitted discharge) amounts to 1,250 pounds per day. Taking this fact and coupling it with the fact that our Texas Water Quality Board permit allows a maximum of 10 ppm oil and grease, and coupling these two facts through a device which I label "mathematical sleight of hand," Diamond's Deer Park Works is charged with the responsibility for discharging 12,500 pounds per day of oil and grease. The fact of the matter, however, is that 10 ppm is a permit parameter, and I am told that at the time this was the lower limit of accuracy for sampling and analyzing for oil and grease, and many analyses taken by ourselves, by county, State and Federal agencies, consistently show that there is no significant difference in the analyses for oil and grease between the incoming channel water and the discharge returning to the channel. In fact, some analyses actually show a reduction in the amount of oil and grease in the water as it passes

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through our plant. This, of course, only emphasizes the difficulty of accurately sampling and analyzing for oil and grease, and we are making no claim for removal of oil and grease from the channel. The same mathematical "sleight of hand" is used in the report for reporting discharges of heavy metals and other pollutants.

Diamond Shamrock Corporation, along with the various county, State and Federal agencies, is very much concerned with pollution control and preservation of our natural resources. We think we are doing a good job in this area, but the business of pollution control is, at best, a complex business. New processes are continually being developed -- new technologies are being applied to improve discharges in existing and proposed plants. Valuable time is lost and only confusion results when cooperation is lacking between industry and government. When 2 years lapse between the taking of samples and the dissemination of the results to the involved industry, and when conclusions are drawn unilaterally which do not take advantage of available facts, no useful purpose is

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served. Over the years we have worked closely and in cooperation with county and State agencies to solve these complex problems, and we are prepared to work equally close and in cooperation with the Federal agencies involved.

We believe the Environmental Protection Agency has an obligation -- to its own technically competent staff, to the citizens of this area, to the newspaper readers across the Nation who have read the sensational articles caused by the erroneous data gleaned from the report, and to the conscientious employees, and to the management of Diamond Shamrock Corporation -- to revise the report, which served as the basis for the technical report presented at this conference, and present the data accurately based on careful sampling and proper analysis to present a true picture of what actually exists in the Houston Ship Channel today.

However, it is my understanding that this conference was called for the purpose of examining the magnitude of pollution of the navigable waters of Galveston Bay and its tributaries and the injury

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resulting to shellfish or shellfish products. I am sure the conference wishes to inquire into the progress that has been and is being made in the control of wastes discharged into these waters. I have stated that insofar as Diamond's Deer Park Works is concerned, we are not responsible for pollution in the Houston Ship Channel by oil and grease and by heavy metals other than mercury. I will speak in a moment about the mercury pollution problem. I am not suggesting that over the years we have not had problems with other pollution control parameters. In our case, basically, these are suspended solids, BOD, and COD. An analysis of our actual contributions on an average annual basis over the years 1969, 1970, and 1971 to date for suspended solids, BOD and COD shows that over this period of time: suspended solids have been reduced by 84-1/2 percent from 36,800 pounds per day in 1969, to 6,700 pounds per day in 1971 to date.

I might parenthetically comment at this point. I have some later data that shows that is cut in half again -- current data.

BOD has been reduced by 46-1/2 percent

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from 5,540 pounds per day in 1969, to 2,970 pounds per day in 1971 to date, and COD has been reduced by 79 percent from 19,000 pounds per day in 1969 to 4,000 pounds per day in 1971 to date. Our present levels for BOD are now in the range of good secondary treatment. These results were accomplished in cooperation with county and State agencies by improvements and changes in our own processes, and by the installation of treatment facilities. As an example, 2 major contributors to suspended solids and BOD and COD from our works were our acetylene plant and our chlorinated solvents plant. A floatation unit was installed in the acetylene plant to improve the methods of collection and disposal of carbon-black, which is a waste product from the operation of this unit. This floatation unit not only effectively prevents the discharge of these solids, but it also serves as a trap for most of the BOD and COD which had been originating from this unit. In the chlorinated-solvents unit, new interceptor and collection sumps were built to trap solvents and solids before discharging to the sewer. A stripping unit was installed to recover the solvents and

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return them to the process, solids from the unit are disposed of by burial.

Currently we are designing for immediate installation a biological treatment plant to further reduce BOD and COD levels.

Finally, I would like to review the problems involved with mercury pollution. I will keep these comments brief, since the subject has been thoroughly reviewed in many forums in the past year.

Approximately 1 year ago now, as the result of work by a graduate student in Canada, it was revealed that fish in Canadian waters had inordinately high levels of mercury in their flesh. The source of this mercury pollution was attributed to a chlor-alkali plant in Canada. The indications that discharge from chlor-alkali plants could result in high level of mercury in fish came as a surprise to the chlor-alkali industry and to the regulatory agencies in the United States and Canada. The immediate reaction of the industry was to reduce the discharge of mercury from their chlor-alkali plants. This action was taken by the industry promptly without discussion as to what constituted hazardous levels of discharge and without any guidance

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from State and Federal agencies as what standards should be met. More than a year later, to my knowledge, only the States of Texas and Alabama have established standards for mercury discharge. While the Federal agencies have made suggestions as to levels of discharge, no Federal standards have yet been established.

In my opinion, the chlor-alkali industry has met the challenge to drastically reduce mercury discharges to the public waters, and the problem of mercury discharges from chlor-alkali plants has been solved. At Diamond's Deer Park Works we are and have consistently been under the 8 ounces per day of mercury suggested by the Environmental Protection Agency and are currently meeting the Texas State standards of a maximum of 5 parts per billion, that's with a "B."

These results have been achieved by the expenditure of more than \$1 million in our Deer Park mercury cell plant, and we expect to spend an additional \$500,000 to make improvements in these control facilities. In many cases, temporary facilities, hurriedly installed last year, have been or will be

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replaced with more permanent, more carefully designed and improved facilities. We anticipate no difficulty in continuing to consistently meet the Texas State standards of 5 parts per billion.

I thank you for the opportunity to present these comments. Our facilities at Deer Park are manned by over 800 Diamond employees. In addition, we employ an average of around 200 contract employees to cover surge maintenance, some specific operation, and minor construction. These employees are handling materials and energy which require correct action and judgment in order to prevent danger to themselves, to others and to the environment. Speaking for them and for the remainder of the company, we appreciate your making the report available to us prior to the hearing. We feel that had we been able to work closer with you on the phases of the report we have spoken to, it would have been more correct and we all could be farther along the corrective path we seek. The job is big enough to require the cooperative effort of industry, local, State and Federal governments, and the public.

Thank you.

(Applause.)

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MR. YANTIS: Mr. Sutter, I do have only one comment because I liked your statement, but I am sorry you said you anticipate no difficulty. We had intended for it to be hard. (Laughter.)

MR. SUTTER: We have accepted the idea of it being hard.

CHAIRMAN STEIN: Mr. Sutter, I am glad to see you again. I didn't work in preparing this report, but as you know, I did work on the mercury problem. I know your industry, you might say, proceeded promptly without discussion. But I know you aren't trying to create the implication that the Federal Government didn't have anything to do with the other industries who discharged mercury and alkali, are you?

MR. SUTTER: When we met in your office on the subject of discharges of mercury, we had already achieved the reduction of mercury down to the levels that you had suggested that you thought were acceptable.

CHAIRMAN STEIN: You made an industry-wide statement here. If the Federal Government didn't have much to do with mercury, I don't know what I am doing here today and will be doing tonight and have been doing

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in that office for the past 6 months.

As you know, we were practically living with your industry in order to get that question resolved, and I think that is a very active program we have.

By the way, I would like to commend your company and the rest of the chlor-alkali industry and other mercury dischargers for the very prompt action they took. But this action, it seems to me, was very closely related to the Federal Government activities in this area, and I know because I was working on it full-time.

MR. SUTTER: Yes, Mr. Stein.

MR. YANTIS: Mr. Stein, let me correct that.

As a result of the problem with measurements of BOD in the Houston Ship Channel growing out of the Galveston Bay Study, we found there was something in the Houston Ship Channel water that made BOD hard to measure. Our consultants determined that it was partly refractory organic chemicals and partly heavy metals.

Now I came across this information in a conversation with Frank Bender and some of the consultants when we were having a board meeting in Houston.

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This was considerably before the Federal Government made any comments of any kind about mercury. And beginning at that point, the State of Texas immediately began a reconnaissance for what heavy metals were and began the drafting of an order.

The State of Texas moved on the control of mercury and other heavy metals before the Federal Government did in Texas.

MR. VANDERHOOF: I don't believe I will buy that comment, Mr. Yantis.

MR. SUTTER: Gentlemen, I am perfectly willing to share the credit for the reduction of mercury with anyone in the room, as long as the record shows that we have reduced the discharge of mercury.

(Applause.)

CHAIRMAN STEIN: Mr. Sutter, in dealing with us -- and I am not looking for any "credit" -- did our records ever show that your plant, in any part of the country, was discharging an amount that you didn't agree with and on which we didn't come to a full agreement on the amount?

MR. SUTTER: That is correct, Mr. Stein.

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CHAIRMAN STEIN: Right. Thank you.

MR. VANDERHOOF: I have a few comments.

CHAIRMAN STEIN: First of all, Mr. Sutter, I do appreciate the fine work that you and other industries have done in the reduction of mercury. However, I would invite your attention to the fact that I did write to every industry that we had sampled that I was going to recommend to my Commissioner a zero level of mercury. Sometime later Mr. Dominick did come out with a policy, and during this interval you did reduce your mercury.

Now, you made one other comment on groundwater with which I concur completely -- it should be observed that there are few, if any, State controls on use of groundwater. Consequently a valuable resource is perhaps being used unwisely, and there is some silence in this area. In fact, I understand, consultants design with the idea that the groundwater is going to subside.

And, then, the last comment I have is that you are taking exception to the data in our document. I would point out to you that these data were taken from State files, and they are consistent with the

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data presented by Mr. Whittington.

MR. YANTIS: Mr. Chairman, the February 1969 data was taken by the State at the request of the Federal Government, analyzed in Ada, Oklahoma, and the information was retaken there.

We have questioned the accuracy, at least of the zinc in those tests, and we do not think this is fully a case of the use of State data, but this has nothing to do with it no matter whose data it is. The method of calculation used in the presentation of the information was without any evaluation by the industry or by the State, and we believe it is erroneous.

CHAIRMAN STEIN: Let me ask just a general question while you are here.

Maybe, if you want to defer this until the conferees meet, you can. But was there any essential difference between the data supplied by Mr. Whittington for Texas and Mr. Gallagher in their reports or were they pretty much the same data -- the same results?

MR. YANTIS: Well, on this, the data we wouldn't quarrel with, the data here -- we would on one of the other companies, even if it is our data,

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because we happen to know something about it which you could have found out simply by asking.

I do quarrel with the method of calculation used, and I think if we had been asked, we could have corrected that too.

MR. SUTTER: Mr. Stein, if I may, please, I would like to cast some light on this.

CHAIRMAN STEIN: Surely.

MR. SUTTER: It was of some concern to me when I looked at the data and started to make some calculations. I was first inclined to ask myself to recalculate all of this data, and they would have come to an entirely different conclusion had they done so. But I realized I would have been building the same house on the same shifting sand of a poor data base, and I began to speculate. If we weren't putting lead, for example, into the channel in the amount of 1,400 pounds, who was? Where was it coming from?

I began to speculate about this. I quickly decided that perhaps I needed better data and better data is available, as Mr. Vanderhoof is well aware. There was data taken two and three times, the most

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recent being in April of 1971 -- April 22 and 23 -- by the Environmental Protection Agency, carefully taken samples, over the 3-day, 24-hour composite, and flown by chartered airplane to Ada, Oklahoma, for analysis. We have asked the Environmental Protection Agency for the results of these analyses, and to date we haven't been able to get them. But we did share the samples with Dr. Quebedeaux's group, with the Texas Water Quality Board, and we did run a full sweep of analyses on these samples ourselves.

If you would care to have me do so, I would be glad to read into the record now the results of some of these heavy metals that came out of this sampling, which would indicate that if the February 1969 grab samples were, indeed, samples for the purpose of analyzing for heavy metals and were, indeed, analyzed properly, there has been a reduction of at least 98 percent of heavy metals in the channel in the meantime. (Laughter.)

The only conclusion I can reach is that heavy metals are not now in the channel and they probably never were.

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Mr. Chairman, we will obtain the data that is being discussed, and I would like to have it put into the record.

CHAIRMAN STEIN: All right. If you can supply this, this will be inserted into the record at this point. (See pp. 1373-1391.)

Again, I know I made this point. Perhaps I didn't make it to the Texas people as many times, because I haven't been down here as often as I have been in touch with some of the industries in other parts of the country who are also represented here. But it seems to me when we talk about cooperation, it is a 2-way street. It also seems to me that anytime we get into any kind of squabble about data or what the physical facts show, we are wasting everybody's time. We should be able to come to an agreement on that. In any case that I have ever been working with the cities and industries on, we have demonstrated that one thing we agreed on was what the facts were. We came to a resolution of that very rapidly.

Now, if there is any question about it and some people might think something is unfairly represented, or the data isn't correct, or you have later information,

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or a sample isn't analyzed correctly, or the mathematical computations are done with a dubious kind of formula, gentlemen, you all know that I have a telephone and I am very responsive to this. If you want us to check with you people when you have a question, okay. I think if we are going to make the cooperative program work, you should call up and check with us too.

And, again, as many of the company representatives here who have worked with me before know, when a call like that comes into my office it gets prompt, immediate attention. Because the worst kind of hangup we can have in this business is a disagreement about basic data when there shouldn't be any disagreement at all. And I don't know of any place we haven't been able to come to an agreement on that and move forward.

If we can't come to an agreement on the availability of the data or the basic data, I think we have to all turn in our cards as professionals in the field and get away.

Now, we have several ways of getting this agreement, and let me tell you very, very briefly how we have done it in the past. We get data that we agree

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on from split samples, or perhaps there is a disagreement on the methodology. You know, sometimes these things are very, very difficult to measure, particularly when they are in small amounts. But then we try to agree on the methodology, and we have always been successful in agreeing with the States and industries on the methodology. I have found in the past that we have all abided by the results that we had gotten from the agreed-upon methodology.

Now, for example, when we got the mercury program going, I think we were as close in submitting the samples as we were on results with the industry to almost infinitesimal differences. I know we are still continuing in that program.

I believe in cases that we have had with a variety of industries, say, in Chicago, Cleveland, Buffalo or the whole of Lake Erie, we have had no differences with the industries on what we were talking about.

And believe me, if we are going to make sense or are going to move ahead in any way on the Houston Ship Channel, we just have to arrive at that

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here. Otherwise, we are not going to get anywhere.

It seems to me this is fundamental before we move ahead. If we can't agree with what we are talking about, I don't know how we are going to come up with an answer.

MR. SUTTER: I agree wholeheartedly about your little black book.

MR. YANTIS: Little white book.

(Laughter.)

CHAIRMAN STEIN: We once had a fellow from Hollywood come and look at our telephones which were black and he said, "My goodness! a black telephone -- what a smart decorating idea." (Laughter.)

MR. YANTIS: Mr. Chairman, it is the lunch break.

I would like to call attention to an old proverb. It says, "Any man has a right to be wrong in his opinions. No man has a right to be wrong in his facts."

I would like to point out that our Chairman yesterday in his comments did say most strongly that if we would stop throwing rocks at each other like kids

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in a schoolyard and get on with the job, we would all be better off. I still agree with that concept, and I think that is the purpose for this conference.

I think you have something.

CHAIRMAN STEIN: Before we break for lunch, I would like to make the announcement about the meeting place. I wish you would circulate this to other people, because I know in a meeting like this not all the people are in constant attendance; some people may be in the hall or caucusing or something of that type. We will meet here all day.

Tomorrow, however, we will convene at the Terrace Room on the 18th floor of this hotel.

If we go to Friday -- and it is beginning to look like we are going to do that more every moment -- we will be back here for the meeting.

May we recess for lunch and reconvene at 1:30 p.m. We have a lot of people, so please be prompt.

(Whereupon, the conference recessed until 1:30 p.m.)

Wednesday, June 9, 1971

CHAIRMAN STEIN: Let's reconvene.

MR. YANTIS: Mr. Keck, are you ready?

There have been a good many people who have asked to be on the agenda for today because of problems tomorrow. Everybody can't be first. I wish this could be true. But we are a little bit like the Irishman where every Irishman is the equal of every other Irishman; in fact, a damn sight more equal.

We simply can't have any more people on the agenda than we have, other than the agreements I have made. I am very, very sorry, but there just isn't that much time. This is the reason that there will be another session tomorrow, and, who knows, maybe one after that.

But I do think you need this explanation -- that there are just so many hours in a day, and we have so many people to put into it. We have already scheduled these people. And so it will be tomorrow for anyone who wants to make a presentation not scheduled. Now, Mr. Keck.

MR. KECK: Thank you, Hugh.

The first speaker this afternoon will be

W. R. Brown

for the Houston Lighting & Power Company. Mr. William R. Brown, the General Counsel, will speak to us.

Mr. Brown.

MR. WILLIAM R. BROWN

GENERAL COUNSEL

HOUSTON LIGHTING & POWER COMPANY

HOUSTON, TEXAS

MR. BROWN: Mr. Chairman, distinguished officials, ladies and gentlemen. I suppose I am in a little bit different position from most of those who have appeared to talk to you. I am actually glad to get an opportunity to talk to the representatives of EPA. I think there is every reason in the world why we should work with each other; why we should cooperate. And in talking to you today I am going to be perfectly frank, Mr. Chairman. I don't think we get anywhere if we don't come out and say what is bothering us. I am going to make some criticisms, but, please understand when I do it, I do it in the spirit of constructive criticism. Now, Mr. Stein, you come here billed as a "real tough lawyer." I have never run from a tough lawyer. I have

W. R. Brown

always found that if you are trying to do the right thing, a tough lawyer is usually the fairest lawyer. So I am here today really to appeal to you and to appeal to Mr. Vanderhoof for some help in trying to get on the track a project which is vital to the industry I represent and certainly to this entire area.

Now I read something in the Congressional Record not long ago which caught my fancy. It was a statement put into the record by a Congressman from California, and I am sorry Mr. Quarles isn't here because he is a Republican.

He made this statement: "You know and I know, and most reasonable people will agree, that if they stop to think about it that electricity in general is among the least of our environmental worries. In fact, it is man's broadest hope for reducing and eliminating the whole spectrum of pollutants."

Now I think that is a true statement. If you just stop for a minute, think of what sort of a chaotic condition you would have without electricity in the complex world that we live in. Our people have estimated that if we lost power in Houston for as much

W. R. Brown

as 30 days, you would have to evacuate the city.

Now when you talk about pollution, you realize that you can't even pump your sewers in this area without electricity. We couldn't be in this room without electricity. We would all be so hot in 15 minutes we couldn't stand it, and in a few more minutes we would probably suffocate.

Now the generating plant that has been brought into issue in this proceeding is the company's Cedar Bayou generating plant, and it is vital. It is vital that we proceed with the construction of this plant, and one bit of criticism that I would like to make, Mr. Stein, is this: That I think your people perhaps get so interested in water quality that you "can't see the forest for the trees."

Now, as you probably know, there are at least 10 or 12 bills pending in Congress now on which there have been recent hearings dealing primarily with reliability of electrical supply.

Now, if I may have a chart that we have, I would like to show you why this plant is so vital.

[Slide H-1.]

W. R. Brown

Now, we have in Texas I am glad to report what is probably the most reliable and strongest electrical system in the United States. It is made up of 6 investor-owned electric utilities, which are interconnected with each other, with the Lower Colorado River Authority -- which is sort of a State TVA -- and with the city of San Antonio, which operates a municipal electrical system.

Now under the agreement by which all of these companies are interconnected, the understanding is that our interconnections will not be loaded. I mean by that that we will try to operate in such a way that we will not be exchanging power except when there is a necessity to do so.

Now, the black line at the lower part of the chart represents the peak load. Then we have a line which shows the capacity that we have. And then we have a line there that shows the units that come on.

Now, if you will notice the gap between the black line and the units, the reason that we put that on is to show this, (indicating), that each new unit is necessary as scheduled in order that there be reserve

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generating capacity equal to the company's largest unit.

Every member of this interconnected group is required by the agreement to have a reserve generating capacity equivalent to its largest unit. Now the reason for that is that if you lose your largest unit, then you can theoretically carry your own load so that you must call on the interconnection only in an emergency.

So, if you will look at the chart -- and that, of course, is our load projection which has to be an estimate, but we are confident that it is accurate -- you will see that in order to comply with our commitments and be eligible to remain a part of this interconnecting system, that we do have to have these units come on as they are scheduled. This includes the Cedar Bayou No. 3 unit, which is scheduled for operation in 1974.

Now, in speaking about cooperation, I thought that we were going to get cooperation. I don't like to admit how old I am, but I have been representing this company since 1937, and I was a part of this project when it started.

W. R. Brown

Now at the Federal level we kicked off with an application that is dated in May of 1968 to dredge an intake and discharge canal, which application was filed with the Corps of Engineers. We had a meeting with the District Engineer in Galveston, and he made it perfectly clear that he could not grant the permit unless there were no objections by any other Federal Agency.

Now we had present at that meeting, 3 representatives of the Corps of Engineers; we had the Regional Coordinator of the Department of the Interior; we had 1 representative of the Bureau of Outdoor Recreation; 4 representatives of the Bureau of Commercial Fisheries, 2 from Texas and 1 from North Carolina and another from Florida; 2 representatives of the Bureau of Sports Fisheries and Wildlife, 1 of those from Texas and 1 from New Mexico.

Now those authorities did not object and we took on the spot a permit which contained these conditions: That the company will comply promptly with any lawful regulations, conditions, or instructions of the State or Federal Water Pollution Control Agency.

W. R. Brown

It contains also this condition: The company will provide a reasonable monitoring program at the intake structure following the completion of each operating unit, to determine whether protective measures will be required for prevention of significant losses of fish and crustacean; and also provide a reasonable water quality monitoring system in Trinity Bay, to begin prior to the time the first generating plant is placed in operation and continue as the units are installed to determine the effect of the cooling water discharge of Trinity Bay.

Now I call your attention to the fact that the word "units" is used. The plans and specifications presented were for the 6-unit plant. Everybody understood that is what we were talking about.

Now then, we agreed to this water quality monitoring program. We agreed to start it before the plant was in operation. We did start it in September of 1969, and the plant did not begin industrial operations until September of 1970.

Now before this we had, however, conducted very extensive research work at another powerplant, which is presently the largest we have, at another

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location where the conditions are so similar that we felt they would be indicative of what we are to expect here.

[Slide H-2.]

Now you see on the slide the location of the P. H. Robinson plant. That is a plant that is located on a similar type of peninsula. You will see its proximity to the Cedar Bayou plant, which is at the top of the chart. We did not do this research work ourselves; we entered into a contract with Texas A & M University, which I believe is recognized to be outstanding in the field of biological research. They started their research project at the Robinson plant in 1967.

Now, in spite of what Dr. Tarzwell said about powerplants in general, I want to say at this point that to the best of our knowledge we have never been responsible for a fish kill -- I mean "ever." To the best of our knowledge, we have never done any damage to the environment.

Mr. Stein, you started out I believe yesterday by saying that every area is naturally different, and certainly we think this area is different

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from Lake Michigan and some of the others that you have been dealing with. The only trouble that we have had with fishermen is that they want to get in to fish close to the discharge canal so bad that they sometimes cut down the fences and sometimes make a problem for us. As a matter of fact, when the Robinson plant was built, we decided we had better join with them, so we built a special parking lot and pier for the fishermen at the Robinson plant.

Now since that time that area has been turned over rent free to Galveston County which has made a park out of it. So instead of creating a mess, I think you will see that the county of Galveston approved this area for a park, and we let them have it.

Another interesting thing about the park is that people catch so many fish there that they don't want, that they carelessly throw them on the ground and then that does create a little environmental problem.

We made the county agree -- I believe that is the only consideration we get -- that they would clean up the fish and that there would be no obnoxious odors from dead fish thrown on the ground. And these are fish

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that are caught, not that are killed in the canal.

Another interesting thing that we found out at the Robinson plant -- and this is contrary to Dr. Tarzwell's conclusions, which I'm sure are based on other areas -- we have found a very significant number of marine life going through the plant, through the condensers, coming out in good shape on the other side. And that will be very material to some of the things that I have to say a little bit later.

Now, I want to explain what we have done to comply with the Corps of Engineers permit in which we agreed to do all of this monitoring.

[Slide H-3.]

We have on the screen now a slide which shows the monitoring stations which we are operating. Now we are taking samples every 2 weeks from every one of those stations. We are sampling both water quality, and biological or marine life.

[Slide H-4.]

Now the slide here that he has just put on the board shows some of the instrumentation that is used in monitoring the water quality. Each time we take a sample we measure the temperature, the dissolved

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oxygen, the pH factor, and the salinity. And then the biological or marine sampling is done in the following way -- we first have trolling.

[Slide H-5.]

This shows the research people trolling for their samples. And then we have seining in the shallower waters.

[Slide H-6.]

And then we take the bottom samples.

[Slide H-7.]

There it shows them bringing up a bottom sample.

We also take plankton samples.

[Slide H-8.]

There is a plankton net, and it demonstrates the way they take those samples. As I said, we take these samples every 2 weeks at each one of these monitoring stations, and the samples are taken to a field lab which has been constructed at the plant, and there people count the samples.

[Slide H-9.]

They measure them, weigh them, classify them, and study them.

W. R. Brown

Now at the discharge point we have continuous monitoring. This is at the Cedar Bayou plant we are talking about. It is for dissolved oxygen, salinity, temperature, and pH.

[Slide H-10.]

Now we have found already that the operation of the Cedar Bayou plant, rather than hurting the environment, is being a definite benefit to the environment and there are 2 factors involved. We are producing a higher oxygen content in the water and we are removing impurities. Now the way that this is coming about in the opinion of our experts is this: The flushing that takes place in Cedar Bayou is having a dramatic effect.

Now I realize I am not under oath, but I could testify because I have seen this myself. I was at the Cedar Bayou location when the construction was first started. You looked down at Cedar Bayou and you didn't see anything except the muddy water, and you couldn't see anything else. I was down there a week or so ago and the water is now clear. Standing at the intake structure, I saw three schools of small fish. I saw a number of larger fish jumping.

Now, of course, my testimony isn't worth a

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great deal. But the marine biologists who are studying this matter, who incidentally are from Texas A & M University, tell us that they have been amazed at the increase in the number of marine life in Cedar Bayou since the plant has gone into operation. They find 6 times as many of some types of fish, and I believe they say that 3 times would be a conservative estimate of the improvement.

Now we think this flushing is also going to have a highly desirable effect on the Trinity Bay side, and I think this will continue as more water is used, as the other units are added.

I believe it has already been brought out in this hearing that one of your problems in Trinity Bay -- it's been off limits for oyster fishing for a long, long time -- you have a low flow. In other words, you don't have enough water really passing through there. And we think that the added water that will be passed through Trinity Bay, the flushing action, will be very beneficial to the body of water.

Now another way that this is undoubtedly going to improve the situation is that we will be putting tremendous quantities of oxygen into the water.

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And if you will look there, I think you will see a very pretty picture of the discharge canal and the first drop structure.

[Slide H-11.]

Now that is presently 28 feet in height. We plan to build a cooling pond which I want to tell you about. When that is built, the height will be 21 feet.

But you can see -- there is a closeup view of it --

[Slide H-12.]

a tremendous amount of oxygenation that is taking place there plus the fact, of course, you have aeration taking place as the water goes through the canal itself. Now in addition we are going to build this cooling pond, and here --

[Slide H-13.]

you see the location, an aerial view of the land as it lies today. Now it is of particular interest, I think, that we are taking advantage of something that is already in existence. That is an area that is already largely submerged.

W. R. Brown

Now we plan to build the dikes for the cooling pond following pretty much the contours of the area that you see in that photograph, if we can have the next slide.

[Slide H-14.]

You will see how the cooling pond is actually just taking advantage of an area that is already inundated.

Now we think, gentlemen, that this is tremendously important. And this is another area in which I would be critical of some of the things I have heard. There should be a greater concern about land use.

Now, if I remember what I was taught in school, approximately 70 percent of the earth's surface is under water at the present time. Thinking of the population explosion and living on this planet in the future, I am sure we are going to run out of land area before we run out of water areas, and I do not think that it is good policy to use up more valuable land than is necessary.

I don't imagine that the audience can see this, but when you have time, you might want to look at

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this, which is another picture of the cooling pond.

[Enlarged photograph with overlay.]

This is the aerial photograph and we have an overlay here which, I think, shows how consistently the pond will coincide with the situation as it exists at the present time, which we think is very important.

Now as to the cooling pond, we think that will operate also dramatically in improving the water quality. The rate of flow through the pond will be slow. The engineers say the residence time will be 2 days.

I understand they mean by that that it will take the water 2 days from the time it enters the cooling pond until the time it leaves, and this will operate actually as a treatment system in and of itself in that you will have 2 days for settling of solids, and also you will have bacterial operations on the solids.

So that cooling pond will improve the quality of water, and at the exit of the cooling pond you can see in the picture, I believe, pretty well that there will be another drop structure which will result in additional aeration and our best estimate is that we

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will put over 100,000 pounds of oxygen per day into Trinity Bay.

Now I want to turn to some of the objections that have been raised to the plant.

I was quite surprised to learn that there is a concern about temperature because the Water Quality Board permit follows exactly the Federal guidelines. Dr. Tarzwell, in his testimony, referred to the "green book," which I understand you use as the bible. It is to me very plain and certainly the Water Board interpreted it the way I do. You probably know it by heart, but I am going to read what it says about temperature:

"Suggested temperatures ought to prevail outside of the established mixing zones as discussed in the section on zones of passage."

The section on zones of passage says, "Therefore, the passageway should contain preferably 75 percent of the cross-sectional area and/or volume of flow of the stream or estuary."

Now we will be within the 1-1/2 temperature limitation within the mixing zone. You will see from the chart there that it does not take up as much as 25

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percent of a cross-section of the receiving water leaving 75 percent recommended passageway. As a matter of fact, the Water Quality Board has found that the mixing zone will cover approximately 20 to 23 percent of the cross-section of the water.

We will not exceed the 1-1/2° in the summer months or 4° allowed in the other months of the year.

[Slide H-15.]

Now, here is the point at which I am going to have to talk about this matter of cooperation, and to be very frank with you I must say that I don't think that we have been treated fairly in the hearing. I don't think we have been treated fairly in the matters that have preceded the hearing.

Now this plant siting is a problem and it is a frustrating one. I want to read you something that I found in the Congressional Record which was said by the Director of Power of TVA in referring to a desirable plant site for an electrical plant. He says this: "The perfect site is one not subject to hurricanes, tornadoes or floods; it should be an endless expanse of unpopulated desert with an abundant supply of very cold

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cooling water flowing nowhere and containing no aquatic life. Most important, it should be adjacent to a major load center." (Laughter.)

Now that is the frustration with which we are confronted. Now everything I have heard about Mr. Vanderhoof has been good. I have actually never met him until the present time.

But this I don't understand: Four months ago, Mr. Simmons went to see Mr. Vanderhoof and told him about the plant and tried to explain what we were going to do. He mentioned Dr. Tarzwell. Mr. Simmons urged that Dr. Tarzwell come down and see the plant, see what we were doing, see what we were planning. And I was shocked when you put Dr. Tarzwell up here as a witness, and he started talking about radiation, and obviously you were embarrassed and stopped that, and then he started talking about fly ash.

Now for a project that is as important as this powerplant is, I think that we deserve better treatment than that. Now that is not the first thing that has happened.

I pointed out that in the Corps permit, we

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thought we had agreed to everything that the Federal authorities wanted. Much to our surprise, when we got to the hearing, which was held in Houston by the Texas Water Quality Board on the plant permit, Mr. Malcolm Kallus appeared to read a statement. Now we know Mr. Kallus; we have worked with him; he is a fine man. We know from his testimony that he didn't write this statement. He read something that somebody had written for him.

I want to just read to you an exchange between the trial examiner of the board and Mr. Kallus.

"Trial Examiner: The second point that you brought up was that you stated that all the alternative means both technically feasible and economically reasonable are available. This, of course, is of most importance at this point because if there are alternative means then ...

"Mr. Kallus: I think we are talking primarily about closed systems and evaporative cooling devices including salt water.

"Trial Examiner: Using freshwater or salt water?

"Mr. Kallus: Either. Two years ago salt

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wasn't very practical, but, I am told now that it is.

"Trial Examiner: Could you refer us to anything on the feasibility of salt water towers?

"About the only thing we have from the Federal people is a little booklet that I got, and that is all that I have available.

"It seems to show quite a bit of problem from carryover of salt. I just wondered if you had anything.

"Mr. Kallus: I am not here today as an expert on salt water cooling towers. I refer you to our Regional Office.

"Trial Examiner: All right. We will be glad to communicate with them.

"I just wondered if your statement had any basis."

Now I think that was a low blow, Mr. Chairman. I don't think you should send a man to a hearing to oppose a permit for a project as important as this who admits that he doesn't even know what they are talking about in the statement that he gets up and reads.

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Now this same thing happened again. You see the way the Board operates, they send a trial examiner around to have a hearing. They had it in Houston, so all the local people could object if they wanted to. Then the board itself has a hearing in Austin. At the board hearing a representative of EPA appeared. The only thing specific he presented was this: "Alternate methods to the proposed method are technically available."

"No reports mention power spray modules. A canal and/or pond system incorporating these modules should be investigated, possibly even with a closed system."

"Our calculation indicates that a closed-cooling-plant system is still a viable alternative. The large amount of land is required and its location does not rule it out."

"We, therefore, recommend to the board that action on this permit be postponed ..."

Now, Mr. Chairman, there is where we get killed. Delay -- and I am not sure I know the reason. But, as a citizen, it shocks me to know that with the

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unemployment that we have in this country, the TVA, which is primarily financed by the Government, is buying power-generating equipment in Europe.

Now if you want a powerplant, you are going to have to get in line, and you are going to have to have your hat in hand. It is hard to get them. You are going to have to place your order about 5 years prior to the time you expect to get your plant in operation.

Contrary to what your witness said, the No. 3 unit at Cedar Bayou has been ordered, and it cannot be moved. These things have to be designed for a location.

The first we heard about locating a plant on the ocean came from Dr. Tarzwell. And, incidentally, we are going to have to build other plants after the Cedar Bayou plant, and we have studied and have continued to study the possibility of locating plants on the ocean.

But the information we have had -- and you probably could help us some on this, Mr. Stein -- is there have been about as many environmental problems on

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the West Coast, where they have tried to locate plants on the ocean, as you have had with other plants.

CHAIRMAN STEIN: That is right. They also have a 20 Delta T.

MR. BROWN: Well, if you could give us a commitment where we could build one and wouldn't have any trouble, I am sure we would be interested down the line, and we are going to continue to study this possibility.

Now one of your witnesses also suggested that we move this plant to the Brazos River. It so happens that we had previously investigated that, and here is where the time comes when you get to I think what would be a criminal use of land. I have been told all my life that the most fertile land in the world is the Nile River bottom and that the second most fertile is the Brozos River bottom. We would have to take 10,000 acres --

CHAIRMAN STEIN: I didn't think anything in Texas was second to anything. (Laughter.)

MR. BROWN: I am trying, Mr. Stein, to state the facts.

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CHAIRMAN STEIN: Right.

MR. BROWN: I have been told that, and I will have to admit we are second on that. (Laughter.)

But I do believe we have the number one electrical system.

CHAIRMAN STEIN: You shattered an illusion.

MR. BROWN: Seriously, I think this is a matter that should be of great concern because Congress is very much troubled about land use, and I think it would be a very, very serious thing should we take 10,000 acres of prime farmland out of use forever for the purpose of building a powerplant. I think the location we have is much preferable to that.

Now I want to talk about the impracticability and unreasonableness of the suggestions that have come from the EPA as to what we should do.

First we have, I believe in a general sort of way, a suggestion that we have at the Cedar Bayou plant a closed-cycle salt water cooling pond.

CHAIRMAN STEIN: Sir, before you go on with that, I appreciate what you said, and we will go into that. But I don't want to get off chasing a rabbit. The

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assumption here is that you are going to have a freshwater source. No one is talking about a closed-cycle salt water system, and no one is proposing it.

If you want to --

MR. BROWN: They did propose it, Mr. Stein, at earlier dates.

CHAIRMAN STEIN: As I read the report and listen, I haven't heard that at this meeting. If you want to talk about that, okay, but I think the assumption has to be if you are talking about a closed cycle, we are talking about a freshwater source.

MR. BROWN: All right. Now whether you know it or not, there has been some very recent conversation about salt modules, and I would like to speak just a minute about the objection to salt modules.

CHAIRMAN STEIN: Go ahead.

MR. BROWN: And salt water towers.

We have computed that, by using either the modules or the salt water cooling towers, that we would be dumping approximately 140 tons of salt per day into the atmosphere, which would contaminate it for any usable purpose. Of course, the corrosive effect of the

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salt makes any kind of a plant out of the question. That I think would be so damaging to the environment that it just must be moved out. Now I am quite interested in your eagerness to talk about the freshwater cooling tower.

CHAIRMAN STEIN: I am not. I think that was proposed.

MR. BROWN: You are not. All right.

CHAIRMAN STEIN: I am not eager to talk about anything.

MR. BROWN: I keep forgetting.

CHAIRMAN STEIN: I am eager to get home. You know, one fellow asked me when I came here, "How do you like Houston?" I said, "I am used to this. This reminds me of Washington in August." He said, "You should be here in August; it's like Calcutta." (Laughter.)

MR. BROWN: You should have been here, Mr. Stein, before we had electric air conditioning. (Laughter.) (Applause.)

CHAIRMAN STEIN: I agree with you if you will give me a moment. I told some of the fellows this -- I have a close friend who comes from Waco, Texas, and

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I asked her, "How did you live there before we had air conditioning?" and she said, "We almost died."

MR. BROWN: It was terrible.

I think, very seriously, air conditioning has changed Houston completely, and I don't believe that we would have ever had the growth that we have had without air conditioning.

CHAIRMAN STEIN: That is right.

MR. BROWN: Also one thing that maybe I keep forgetting is that I want to get your help. I want to get some cooperation, and we want to cooperate.

I just don't believe that we for some reason -- we don't seem to be able to get anybody to really seriously talk to us.

Now I want to talk now about the salt water -- I mean, the freshwater cooling tower.

Now I didn't hear a word from any witness about the consumptive use of water. Now we have computed that to have freshwater cooling towers for this plant would require a consumptive use of water of 75,000 gallons per minute, 24 hours a day, and that would require a pipe approximately 7 feet in diameter to carry that water.

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Now you and I are not going to throw bricks at each other. You said you couldn't hide behind a bush, but you could get in that pipe and throw one.

(Laughter.)

Now getting back to the very seriousness of it, that quantity of water is approximately the amount of freshwater you need for a city the size of Dallas, Texas.

Now it is just absolutely incredible that anybody would come here and recommend that we use freshwater cooling towers. There is no way that I see of explaining it.

Mr. Vanderhoof talked this morning about the critical situation with freshwater. We had a very learned witness yesterday from NASA who was talking about having his people drink distilled sewage. Now that is not too farfetched. I have read articles that say it is not too long in the future when all of the water we drink will have been through a human body at least 3 times.

CHAIRMAN STEIN: You would be surprised how much we do that now. Have you ever been in a city on

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the Ohio River?

MR. BROWN: Right. I don't leave Texas very much. Right. (Laughter.)

As far as the temperature is concerned, Mr. Examiner, we will be operating within what we understand the guidelines to be, and, incidentally, it would be at a temperature comparable to that we have at the Robinson plant. And the people from A & M who have researched the Robinson plant have concluded that it definitely does not do damage to the environment and that it is beneficial to the environment.

Now the Texas Water Quality Board has not been unmindful though of the kick that we are all on about temperature, and they did put this in their permit, which I would like to call to your attention.

"The permittee shall institute a program of investigating the application of mechanical-cooling devices which may be utilized in the future to further increase the efficiency of the condenser water cooling system.

Permittee shall submit to the Texas Water Quality Board quarterly progress reports beginning March 1, 1971, and continuing until March 1, 1974."

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So if there is anything that is invented that is technically feasible -- bear in mind in this, we can't operate without it -- we have agreed to comply with any lawful order of either the State or the Federal Government.

So if technology improves to the point -- and I am not sure you would want to do it when this is studied, because our technicians and A & M research people really think the hot water or heated water is being very beneficial to the marine life -- so whether we want to do that in the future or not remains to be seen.

Now there is one other bugaboo that we have got to talk about, and that is the concern over our transporting ship channel water, as it is called, over to Trinity Bay. Now we do not think that that will be a problem, and there is a reason why we think that is the case. We have had the Cedar Bayou project studied very thoroughly by 2 very eminent biologists at the University of Texas, and you evidently respect them because in Mr. Gallagher's report he cited them twice as authorities -- Dr. B. J. Copeland and Dr. Gus Fruh. Their conclusion

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is that the Cedar Bayou plant will not damage the environment and if anything will be beneficial.

They, along with the other scientists who have researched it, have found that there is a possibility that during as much as 3 percent of the time -- that would be approximately 11 days out of the year -- you might have some water, and I don't think it is Ship Channel water, but, at least, water of poorer quality that would come from the channel.

Now there are a number of reasons why we don't think this is going to occur.

If I could have the next slide, I will show you first --

[Slide H-16.]

If you will, Mr. Stein -- if you could see there where we have dredged that intake canal, it comes down as close as we could bring it to the major land area and as far away from the ship channel as possible. If you would, point to where the channel is.
(Indicating.)

You see the place where the intake canal is going to be; it is going to be separated from what is

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actually the Houston Ship Channel by what is known as Atkinson Island.

We can see there is a possibility that some of this water -- it would take a high flow condition sustained for 2 days for any significant amount to get into the intake canal. Now you have already heard considerable testimony about the improvements in the quality of the water down in the area where you see the intake canal. Bear in mind that the third unit is not scheduled for operation until 1974. We think that there will be substantial additional improvement by that time.

But I suppose the main reason that we feel that there is not going to be a problem, and why the scientists have concluded that there will not be, is that we are operating under comparable conditions at the P. H. Robinson Plant at the present time.

[Slide H-17.]

Now there we show, Mr. Chairman, the Robinson plant. You see the intake canal is on Dickinson Bay.

If you will remember, Mr. Gallagher said

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Dickinson Bay is the worst body of water we have next to the Houston Ship Channel. Now that is where we are taking the water now, and we have not killed any fish to the best of our knowledge, and the A & M research people have for 4 years found this plant to be, as I said, not damaging to the environment.

[Slide H-18.]

Now I want to show you -- and I hope I can get your attention --

CHAIRMAN STEIN: You have our attention. The question I asked him -- and, maybe you are right if that is the second body of water -- I asked how many fish do you have to kill --

MR. BROWN: There are a lot of fish there. You would be amazed at the discharge site. When the people go out to take their samples and do their research work, I understand the fish are actually so thick -- and I am not kidding you -- they have difficulty in walking in the general part of the water. (Laughter.)

CHAIRMAN STEIN: Are you sure they are not electric eels?

MR. BROWN: Not what?

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CHAIRMAN STEIN: Not electric eels?

MR. BROWN: I really am serious about that. I haven't been there myself, but the researchers from Texas A & M have.

Now here is the thing that I want to tell you. It is this -- we are so sure that the Cedar Bayou plant will not damage the environment that we are putting in a system to police ourselves that we think will be, you might say, foolproof. And if there is anything damaging about it, we are going to convict ourselves.

[Still slide H-18.]

Now you have an aerial view there of the discharge canal, starting where the drop structure is from the plant itself into the discharge canal. Now immediately to what would be the left of that canal on the picture, we are going to put in a marine lab which will consist of a series of tanks in which we will have all types of marine life.

[Slide H-19.]

Now you have on the slide an artist's conception of what we will have. The marine lab will

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be at the far, far end of the picture. Now in this marine lab, we are going to be pumping the water right out of the discharge canal into the marine lab. We will have a series of tanks in which we will study the effects of the discharge water on all types of marine life at all varying temperatures.

Now in addition to that, we are building 25 quarter-acre ponds, and they are the things that are shown here in this picture.

[Still slide H-19.]

Now this water will be pumped, as I said, right from the discharge canal into these tanks.

Now there will be no temperature control at all in these tanks. They will be 7 feet deep at one end and 3 feet deep at the other. That, of course, will give you a temperature variation.

We are going to simulate there as closely as possible the condition that will exist in the cooling pond itself.

Now by having the 7-foot depth and the 3-foot depth, a fish can naturally seek the temperature which is most compatible to him.

Now the reason this is going to be such an

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excellent policing system is that we are going to have under constant surveillance the marine life and the effects of this discharge water on the marine life.

Now if there seems to be any adverse effect whatsoever on the fish that are in these ponds or tanks, we will immediately take the ones that are affected. If we find that they are suffering from a source of pollution, it will be immediately reported to the Texas Water Quality Board, and we expect them to get after the polluter.

Now there are a lot of young people in the audience that probably don't understand, but in a powerplant we don't add anything to the water; we take it as it is and use it for cooling purposes only. It just goes through the plant once. We do put a small amount of chlorine.

CHAIRMAN STEIN: How do you stop your fouling?

MR. BROWN: What?

CHAIRMAN STEIN: Do you have any fouling problems?

MR. BROWN: Well, there is a screening.

CHAIRMAN STEIN: You put a little chlorine in?

W. R. Brown

MR. BROWN: Yes.

CHAIRMAN STEIN: But that is something
you add.

MR. BROWN: Right.

CHAIRMAN STEIN: That is right. All right.
Thank you.

MR. BROWN: There is a screening.

CHAIRMAN STEIN: I understand now.

MR. VANDERHOOF: You are only adding
chlorine and heat?

MR. BROWN: That is right. I mean the
sample water. The water samples on the intake and
discharge is essentially the same.

CHAIRMAN STEIN: All right. Thank you.

MR. BROWN: The point is that if there is
any adverse effect at all on the marine life, we will
detect it almost immediately in these tanks and in
these ponds, and it will be reported.

And by dissecting the affected fish, we
should be able to lead the Water Quality Board to the
offender. We are not going to hesitate to turn in the
guy who is dirtying the stream, I will tell you that.

W. R. Brown

Now bear in mind that I said at the outset that to the best of my knowledge, we have never done any damage to the environment. We have never killed any fish. If this doesn't work, we are going to find something that will work. This is by no means the end of the road. We are absolutely committed to the proposition that we are not going to damage the environment.

Now in these labs we are going to, in addition to fish, study plankton and we expect to be able to prove that the heated water is actually an economic and ecological asset.

We are convinced from the studies at the Robinson plant that there are enough shirmp larva that are coming through the plant unharmed that, in the cooling pond itself, we should have a nursery of tremendous importance.

Now you will be interested to know that we have designed the drop structure at the exit of the cooling pond in such a way that we can control the depth of the water. That will permit us to study at which depths the shrimp live best. In other words,

W. R. Brown

where you get the greatest areas that will be beneficial to them.

We expect to be able to show that the heated water can be utilized and a great deal can be made of it for very beneficial purposes.

Now I would like to close, Mr. Chairman, by saying this -- the people that know us best and the people that live with us and around us all have faith and confidence in us.

Now the Governor of Texas was present when this plant was dedicated, and I would like to read you what he had to say about this: "I think the State of Texas can be proud that Houston Lighting & Power Company has taken every conceivable precaution to insure that the operation of the Cedar Bayou Generating Station does not do harm to the environment. Hopefully, this Cedar Bayou plant will prove to be a model of what industry can do, will do, and should do to preserve and protect the environment."

Now the closest municipality to the Cedar Bayou plant is Baytown. The Mayor of Baytown was there, and quite some time ago the Baytown Chamber of Commerce

W. R. Brown

passed a resolution commending us and endorsing the project. The Mayor of Baytown was there and spoke in very complimentary terms about the plant and the company's attitude about the environment.

The plant will be located in Chambers County. In Texas the governmental head of a county, for some reason, is called a county judge, although he doesn't have to be a lawyer. The county judge of Chambers County was there. Here is what he had to say about it: "We sincerely appreciate your attitude and activities directed toward preserving and improving the quality of our environment. Your expenditure of vast sums of money for research in the field of marine biology and ecology is a direct measure of your dedication and honesty. We have full faith in you. We believe in you."

Now I just wish I could get you people to believe in us too, and I think if you will check, I think you will find that we are worthy of your trust. We have dealt for years with the Corps of Engineers. I think they will speak well of us.

It is customary I think when you try a lawsuit to suggest what you think the court should find.

W. R. Brown

Here is the recommendation that I think you should make about this plant: "We have reviewed the plans of Houston Lighting & Power Company and find that it has, in good faith, developed a comprehensive plan for the protection of the environment in the vicinity of the Cedar Bayou Generating Station.

"In addition, it has given the U. S. Corps of Engineers the following commitment: 'Permittee (Houston Lighting & Power Company) shall comply promptly with any lawful regulations, conditions or instructions of the State Water Pollution Control agency and/or the Federal Water Pollution Control Administration which involve the waters affected by the works and/or the project hereby authorized.'

"We have checked with both Federal and State Agencies with which Houston Lighting & Power deals and find its reputation for keeping its commitments is good.

"In view of the assurances which it has given in the Corps of Engineers permit, we recommend that it be allowed to proceed with its Cedar Bayou plant project which is vitally needed for the protection of the health and welfare of the people of Texas and for the

W. R. Brown

protection of the environment in which they live."

I think we are really entitled to that.

CHAIRMAN STEIN: Thank you, sir. I really appreciate your statement. Can you give us all copies of those charts for exhibits?

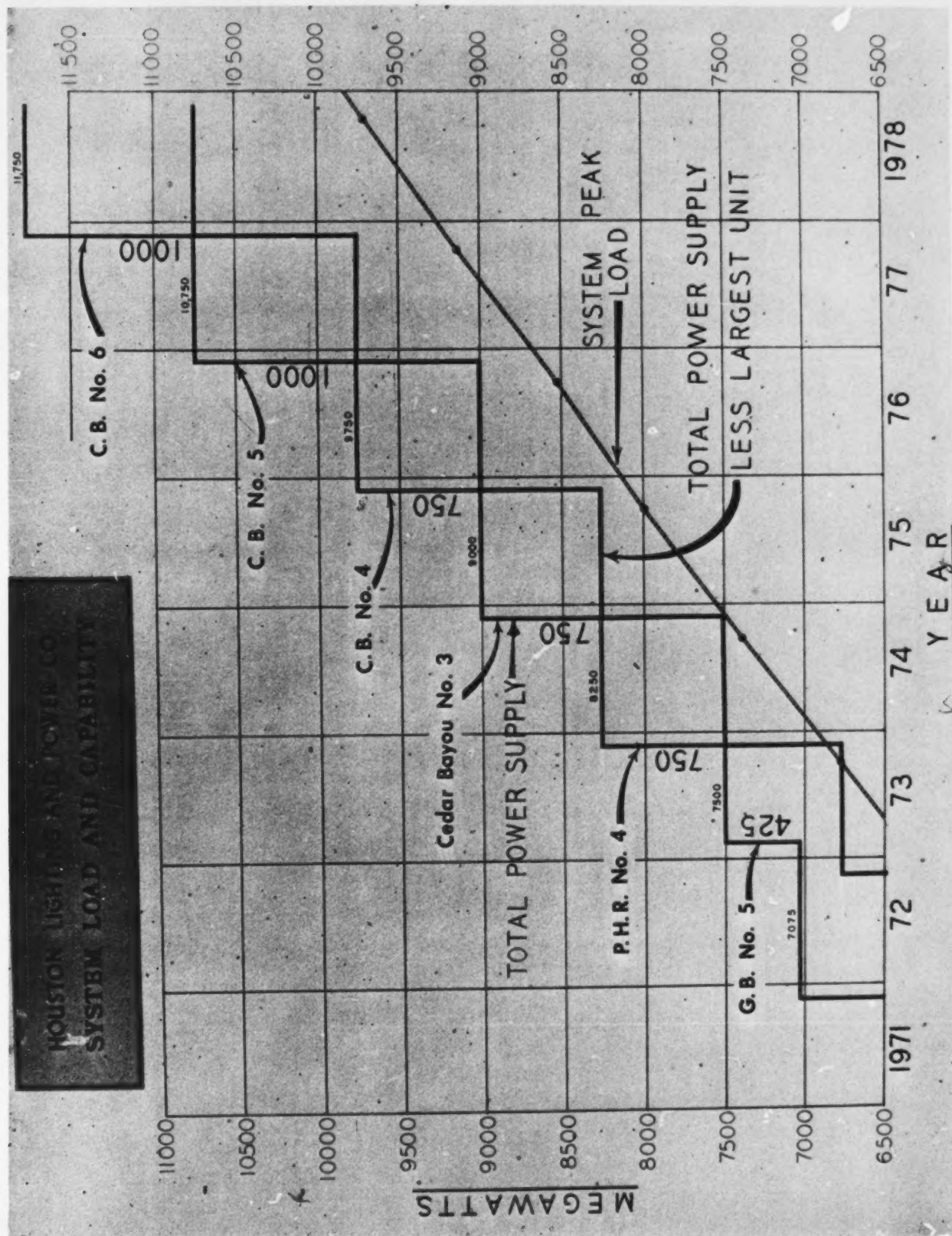
MR. BROWN: Yes, sir.

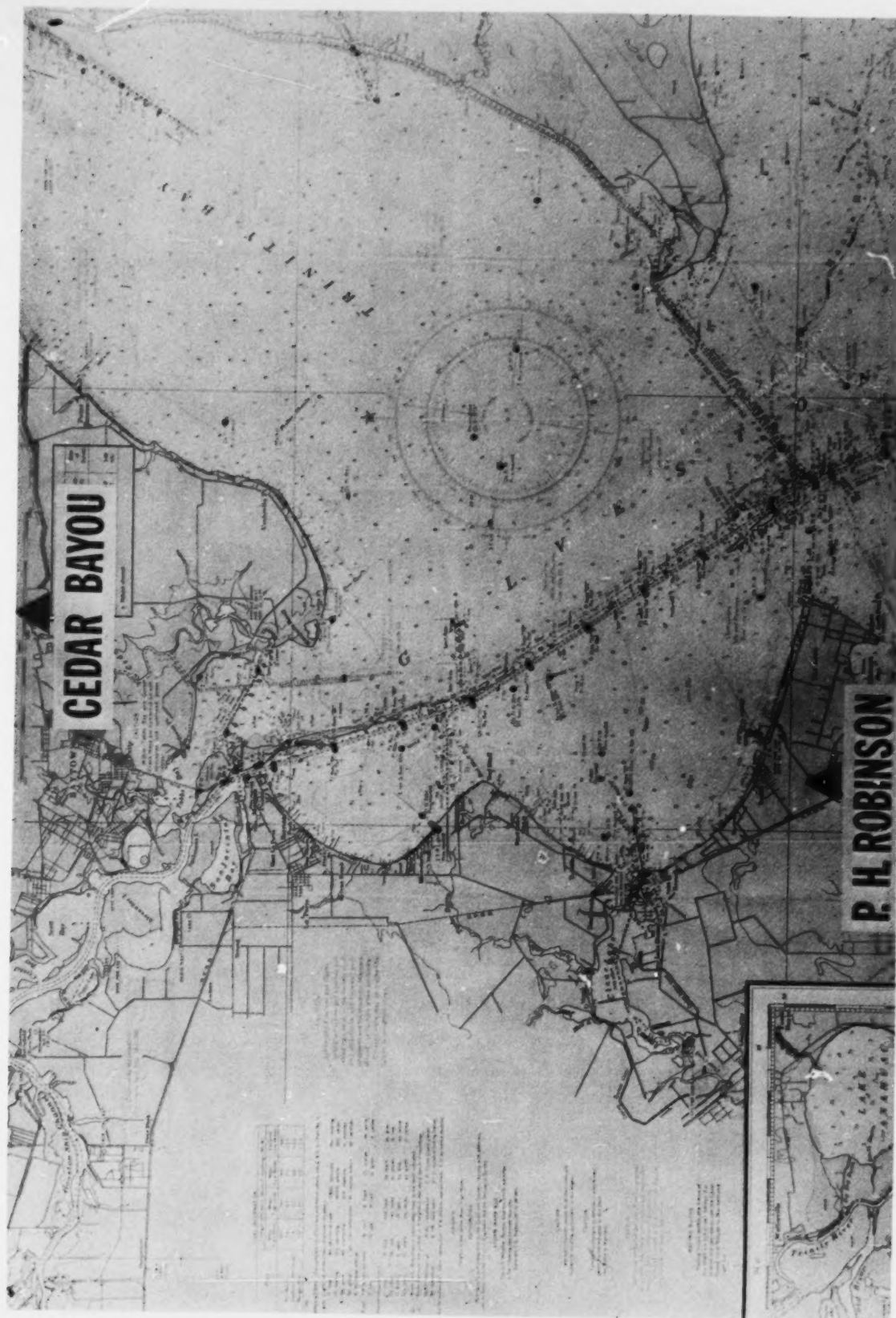
CHAIRMAN STEIN: Can you give us two prints of each?

MR. BROWN: Yes, sir. We will be glad to.

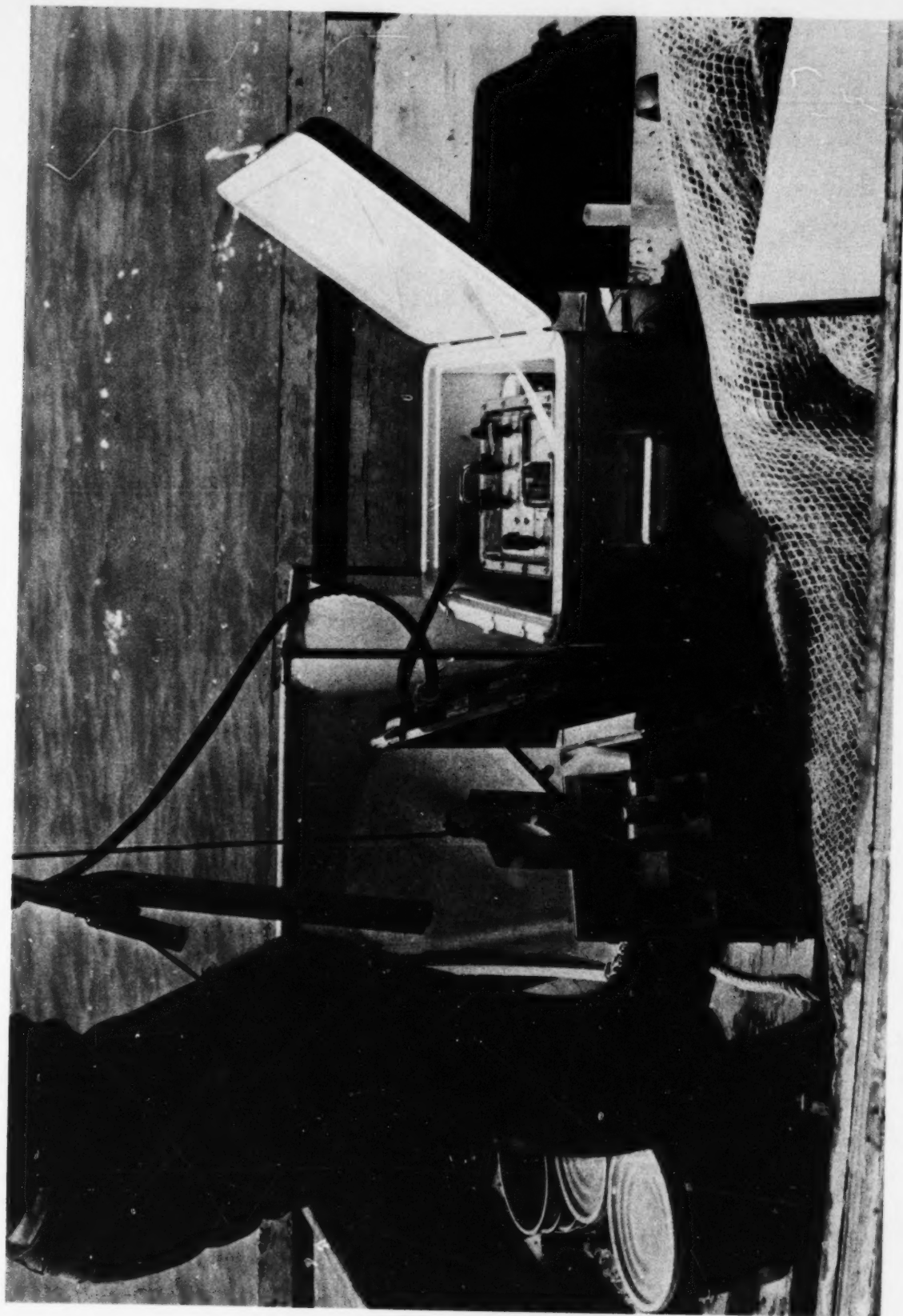
CHAIRMAN STEIN: They will be a part of the record.

[The above-mentioned slides follow.]



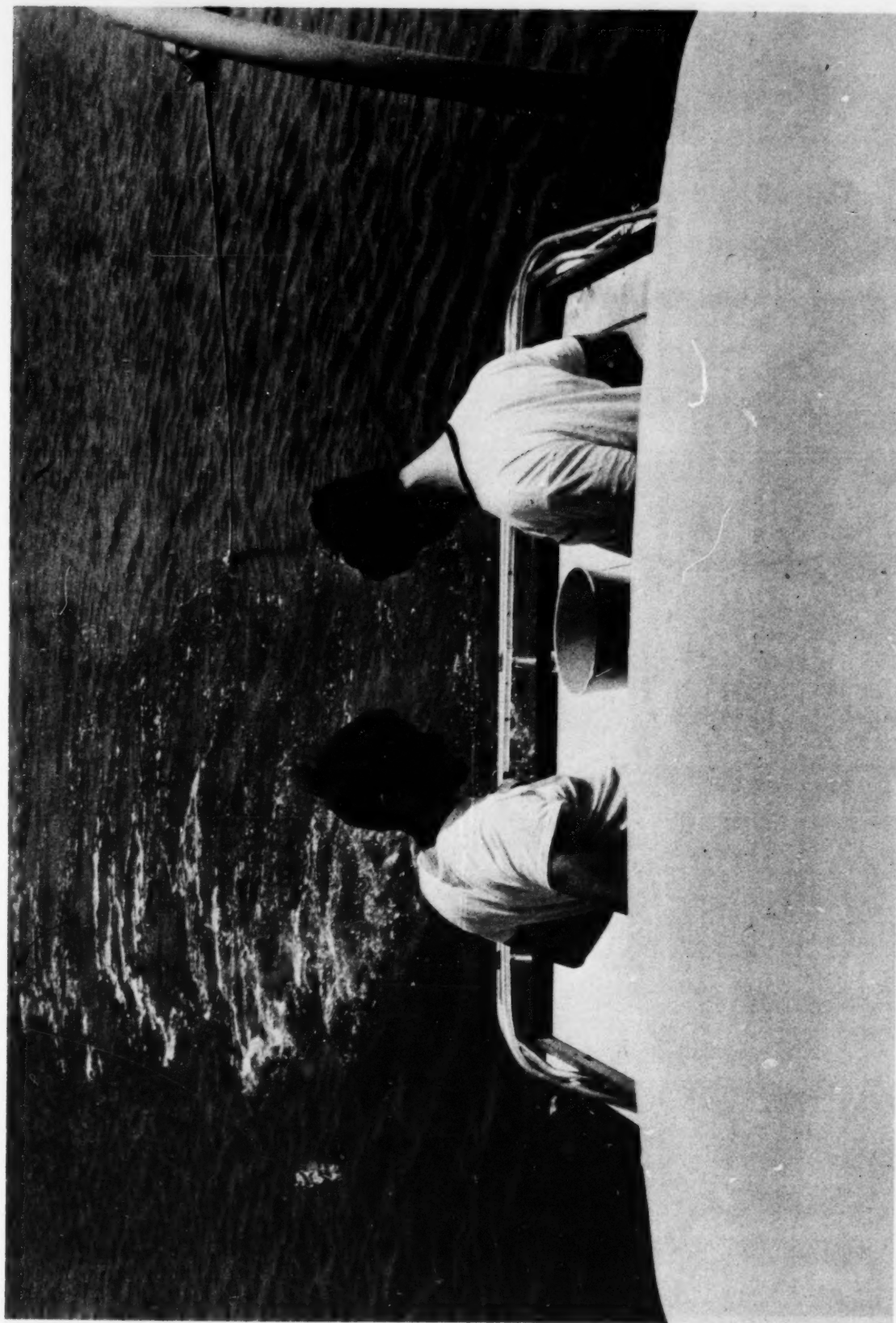


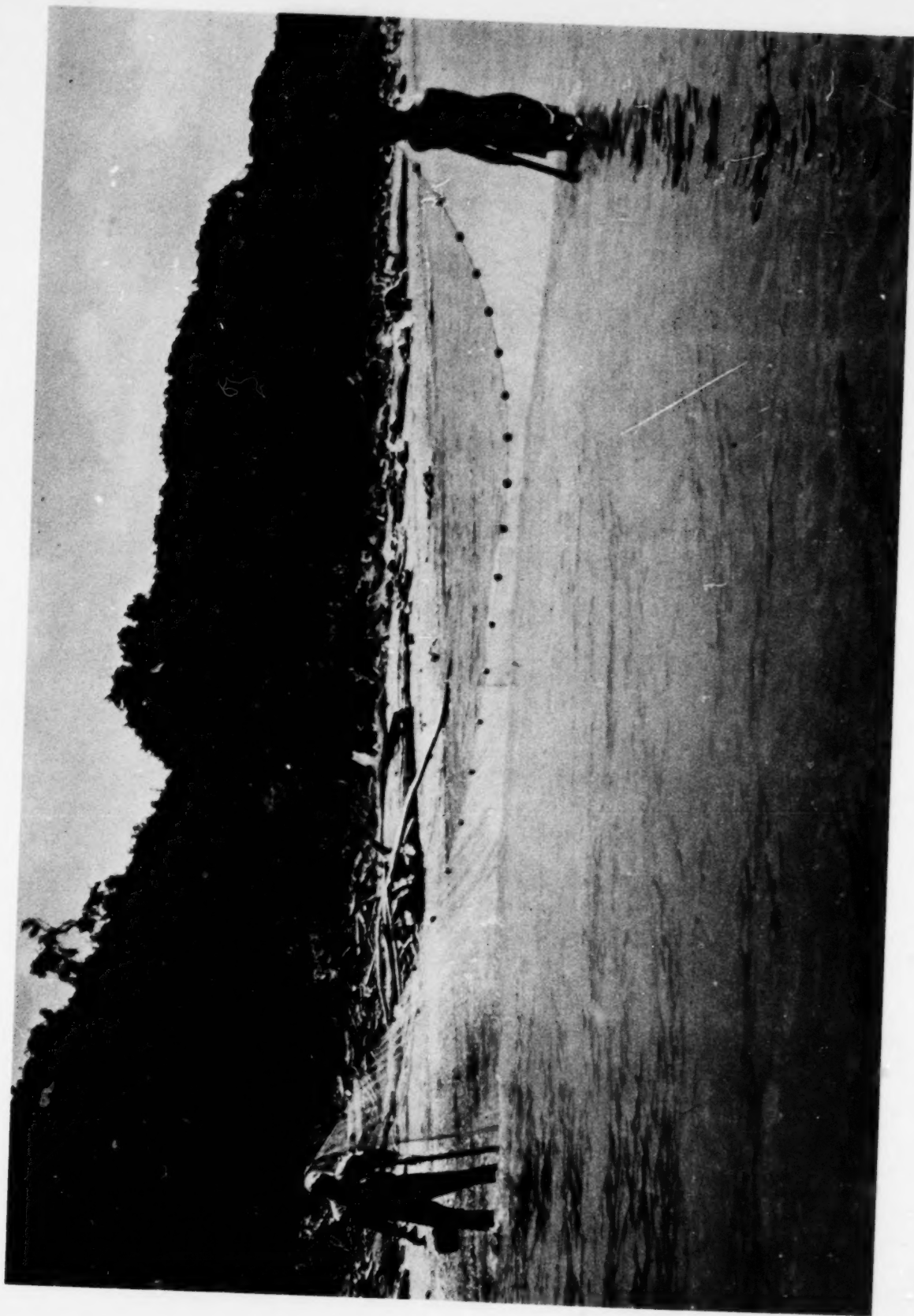
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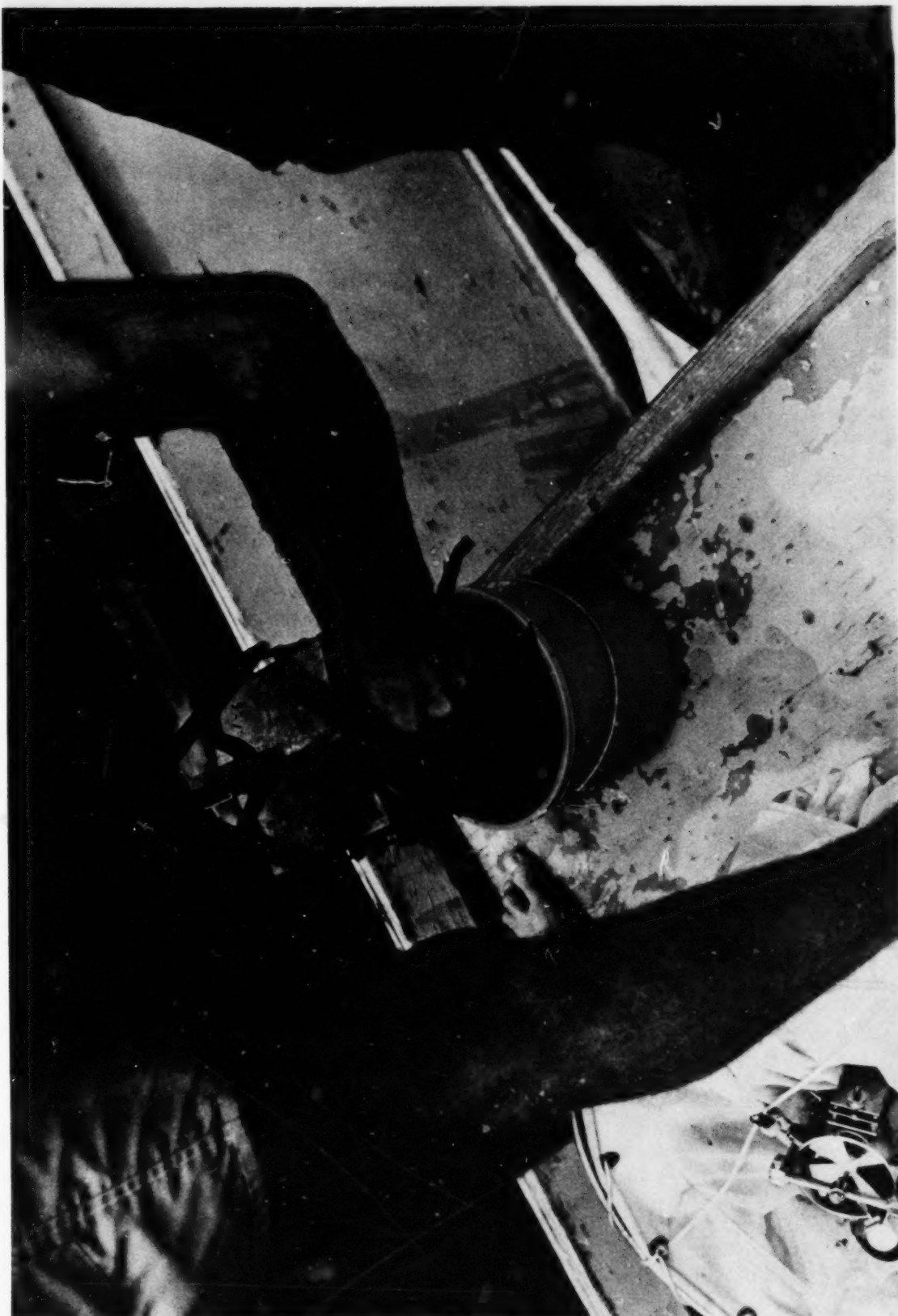


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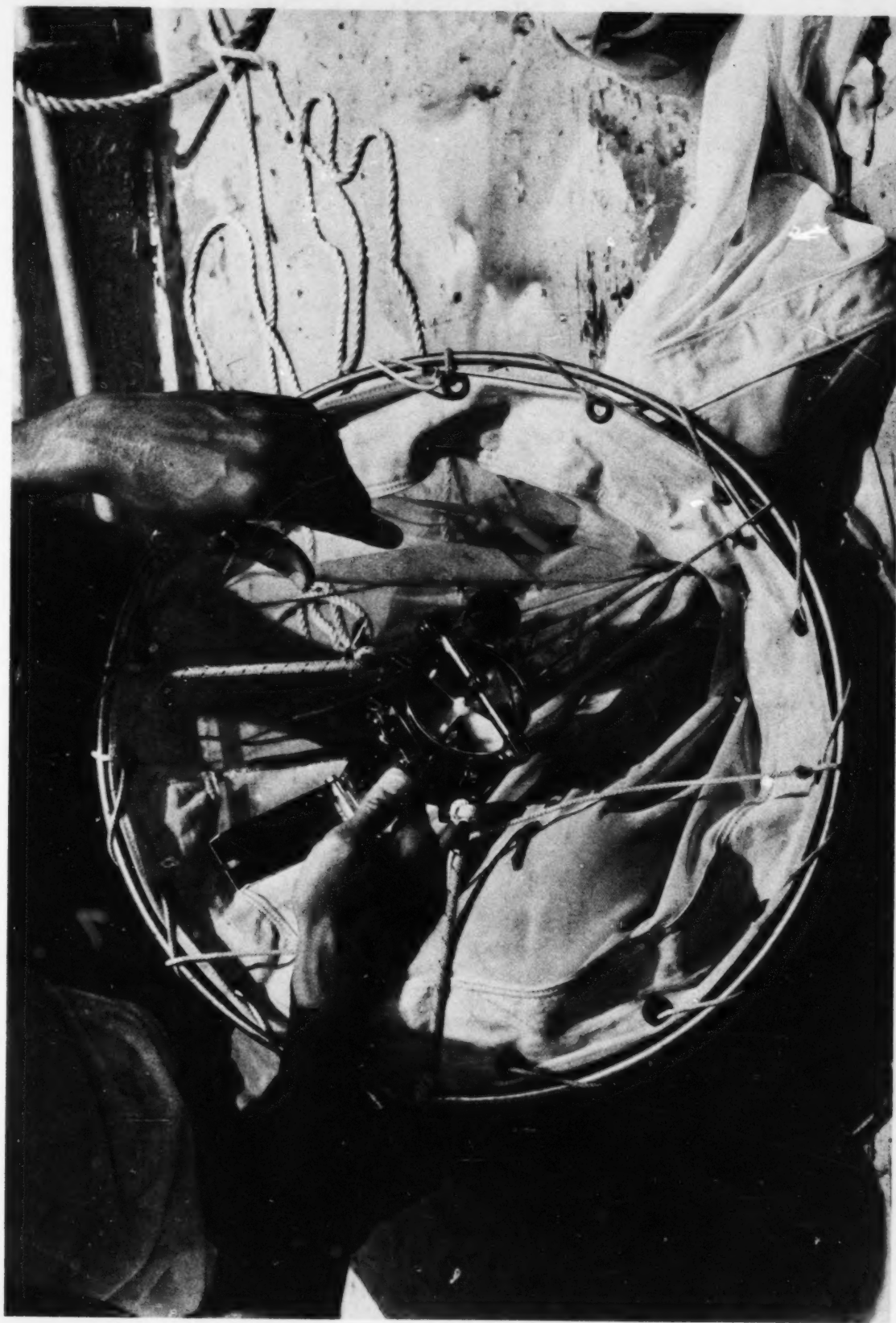
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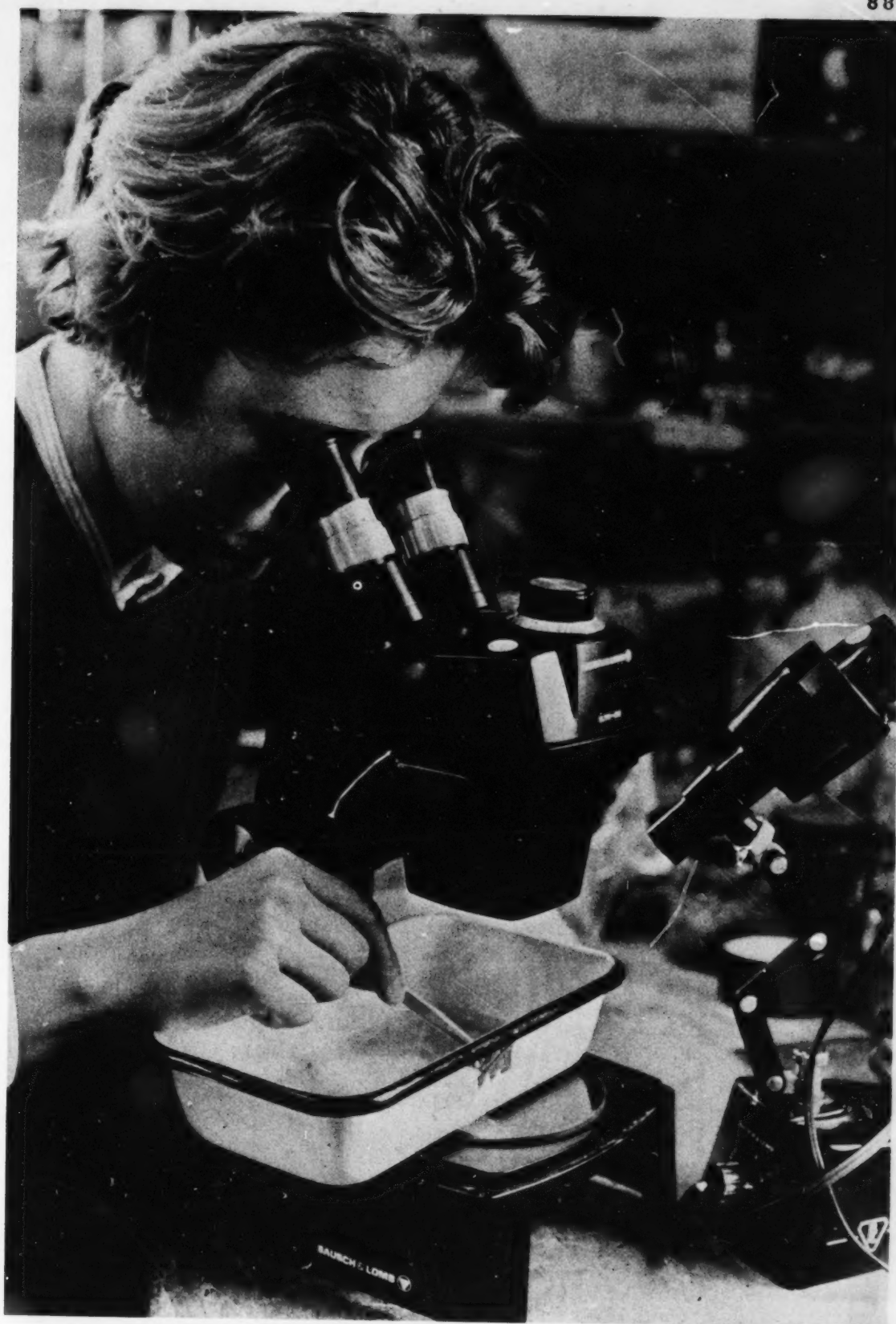






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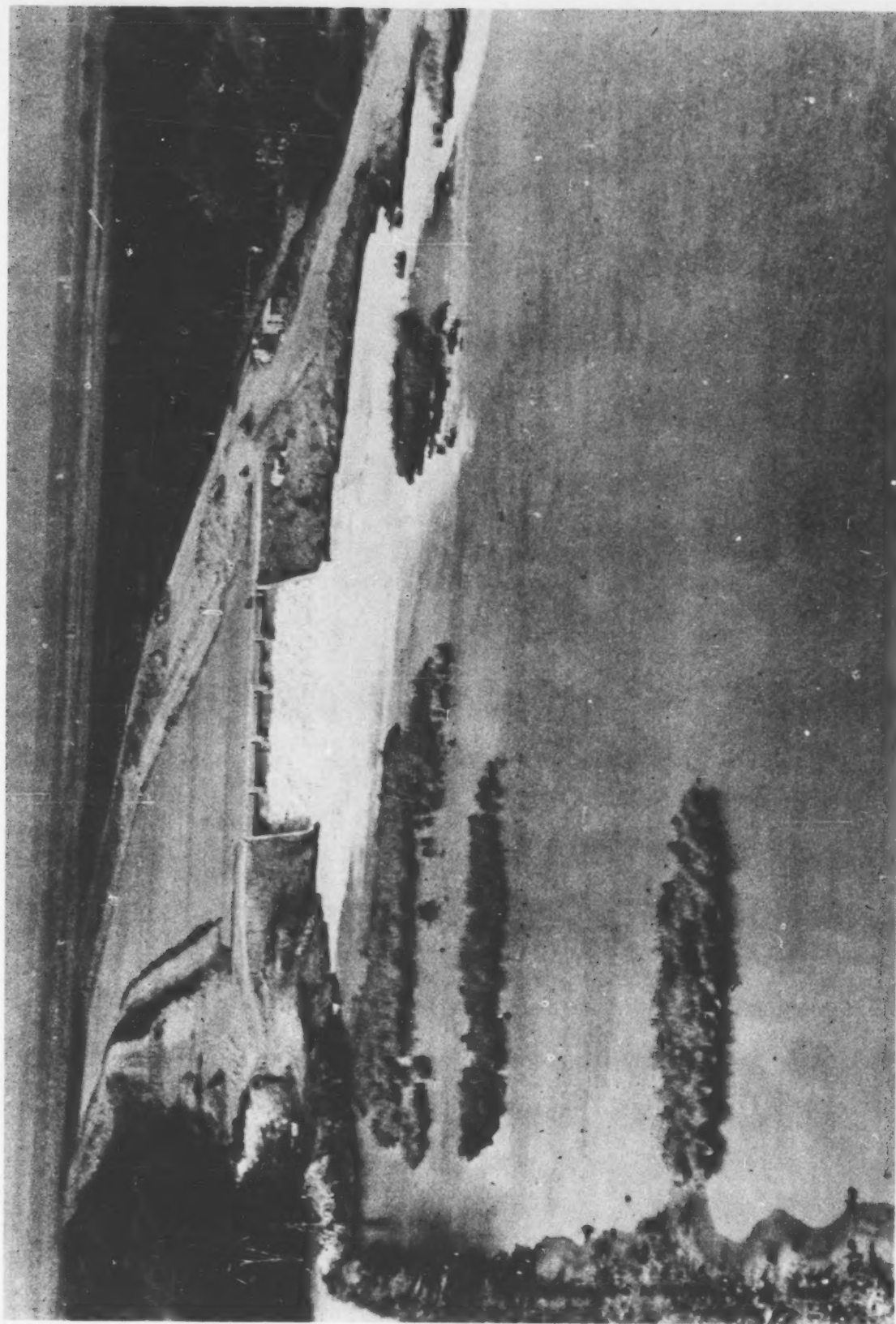
CONTINUOUS MONITORING

DISSOLVED OXYGEN

SALINITY

TEMPERATURE

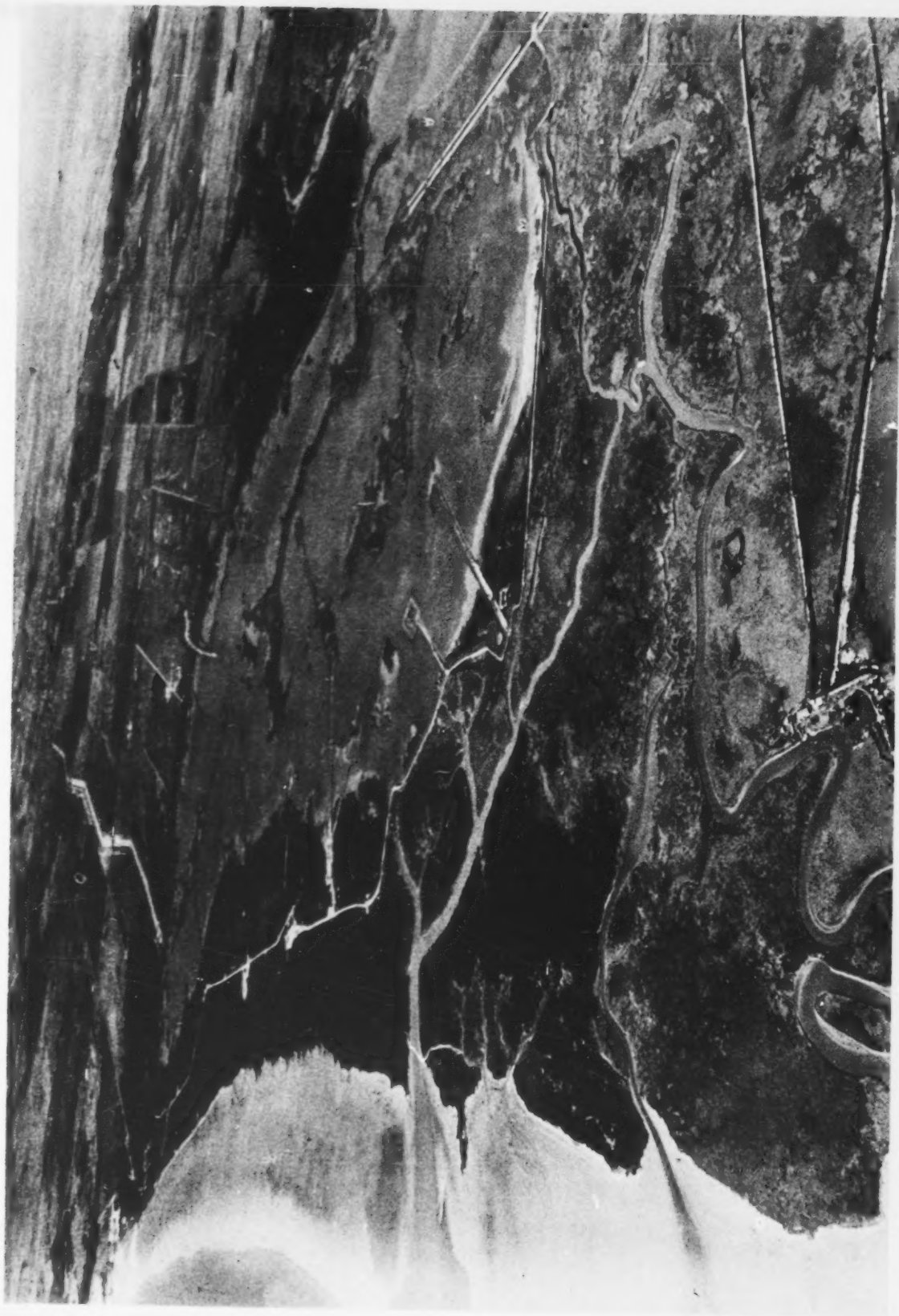
pH



H-11

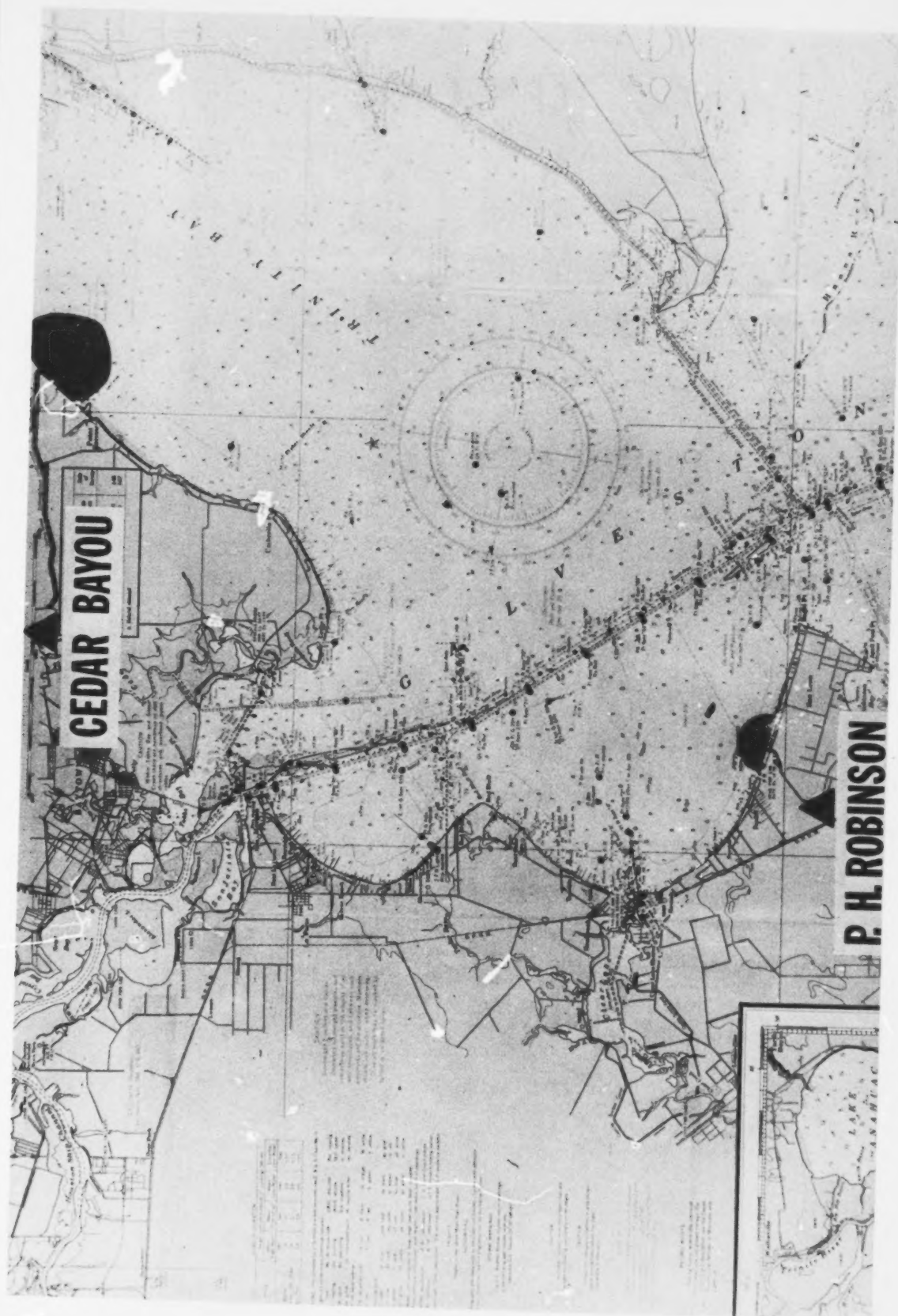


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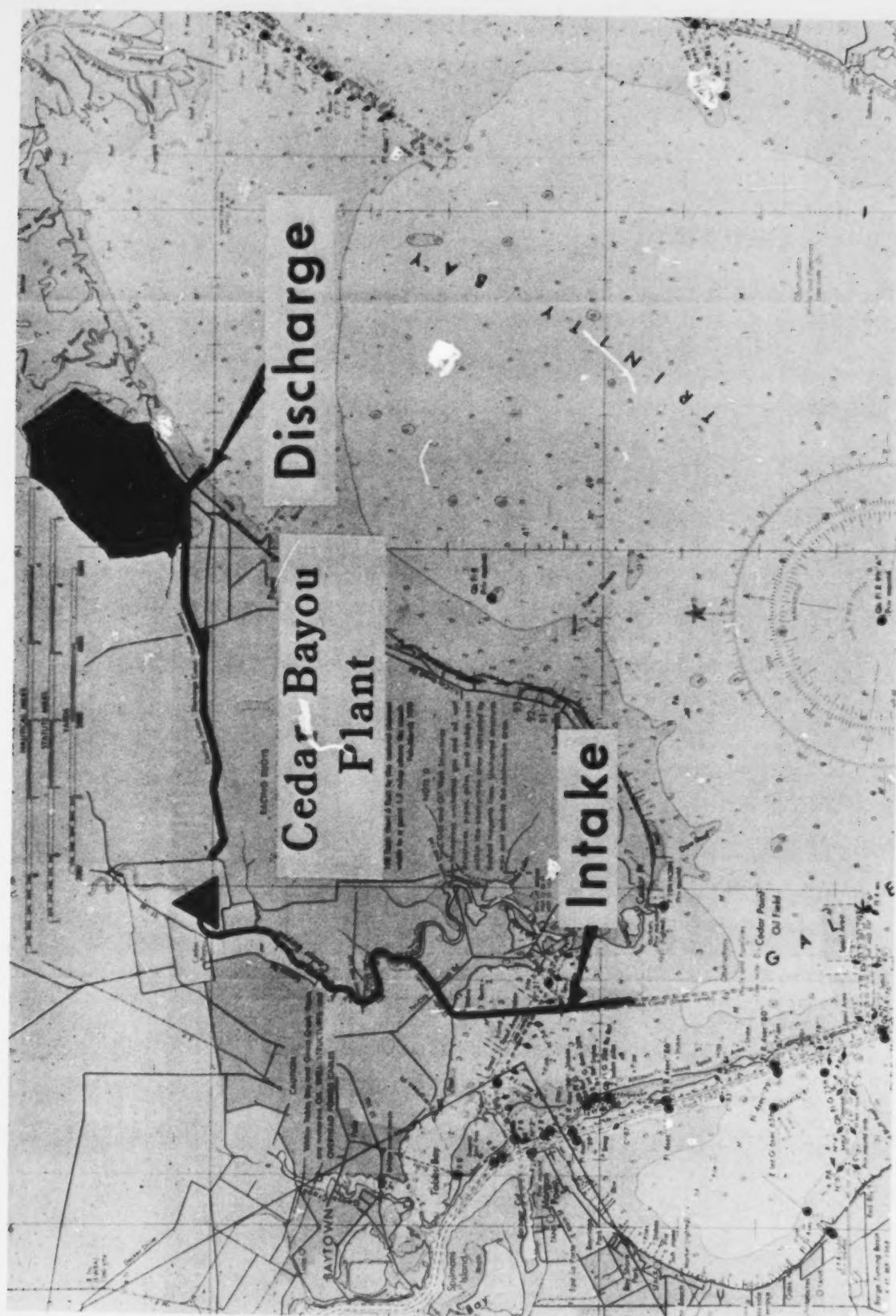




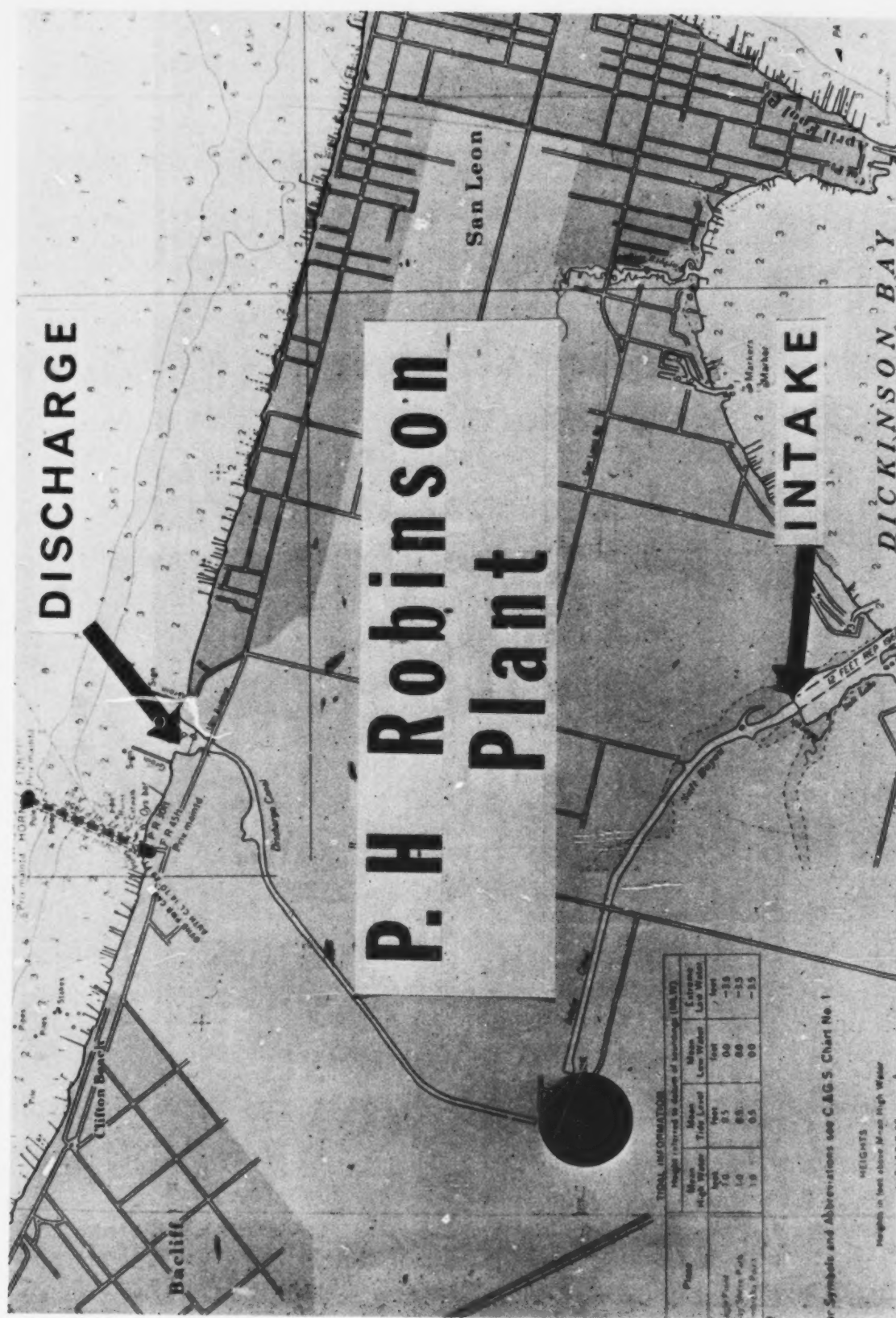
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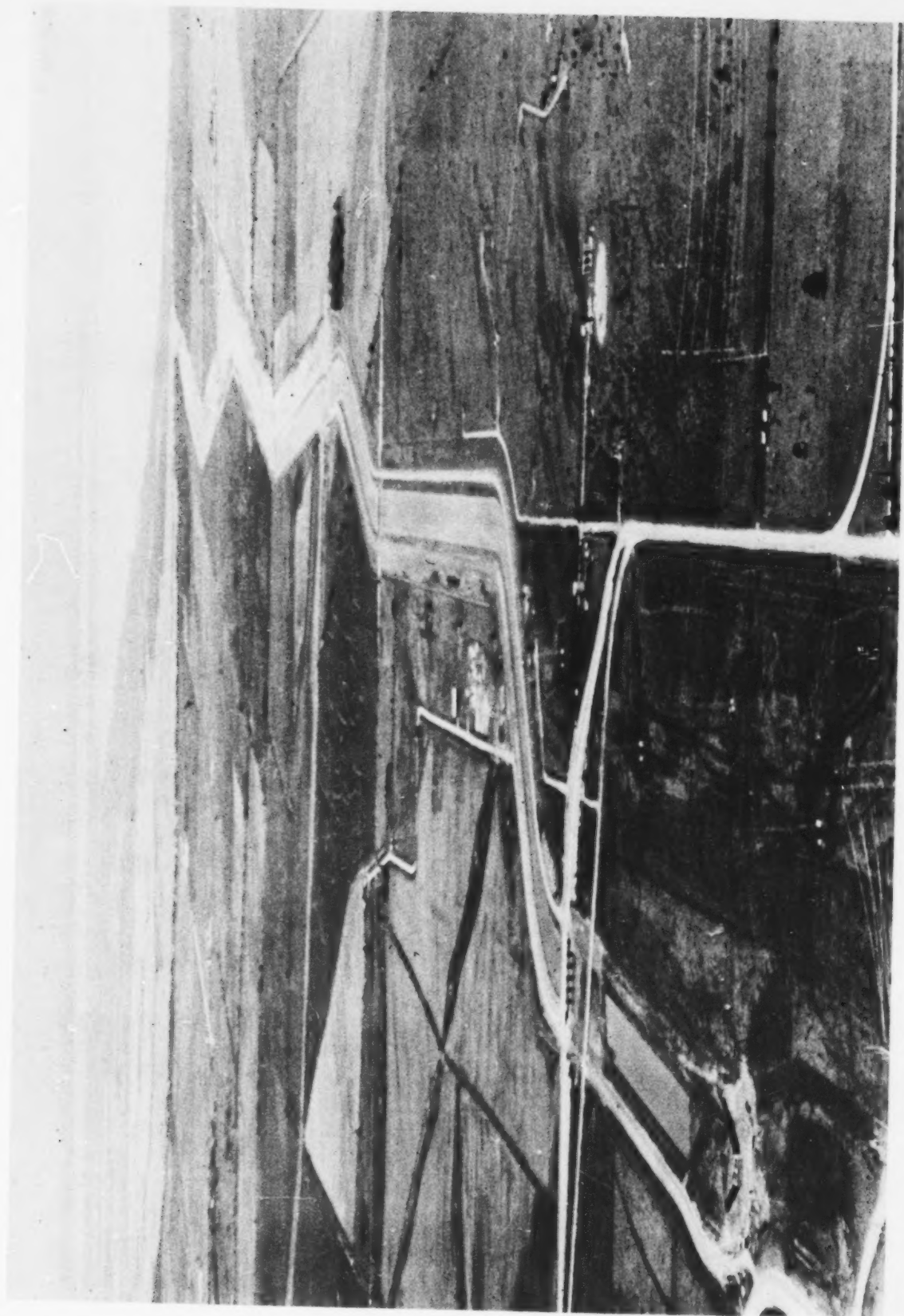
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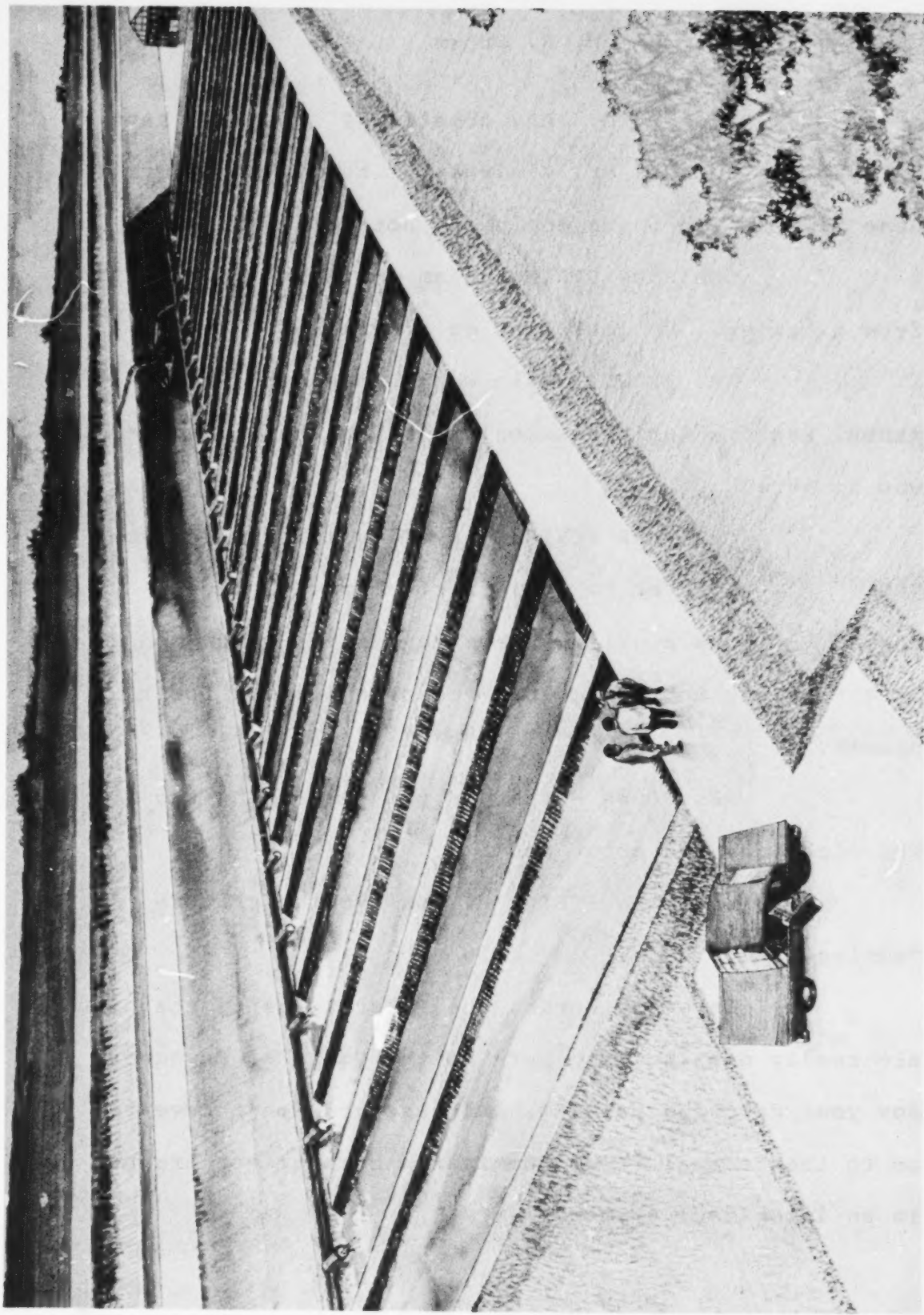
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H-17



H-18



W. R. Brown

MR. BROWN: Any questions? I should have said at the outset, Mr. Chairman, I have with me Mr. Gene Simmons who is an engineer, not a lawyer.

CHAIRMAN STEIN: I am delighted to hear from a lawyer. My questions go to you.

MR. BROWN: Also we have on our environmental staff a marine biologist with a Ph. D. degree who is here.

CHAIRMAN STEIN: May I just hear from you?

I refer to your first chart. I have looked -- it is a grid intrastate permit -- you don't have to apply to the Federal Power Commission for a permit.

MR. BROWN: That is the only thing the FPC might say bad about us.

CHAIRMAN STEIN: I don't think that is "saying bad."

In other words, the Federal Agency that you are really dealing with here is the Corps of Engineers for your dredging permits, and also you don't have to go to the Federal Power Commission because you are not in an interstate system.

W. R. Brown

MR. BROWN: We are not under FPC jurisdiction but we work closely with them, and they know us very well. We file a Form I report with them every year.

CHAIRMAN STEIN: Now the other point I have -- and I checked with Mr. Vanderhoof -- we invited the Department of Interior here, but they are not here. You claim, and I have no judgment on this, that the water you are putting out is beneficial to the fish.

Supposing we ask the Fish and Wildlife Service of the Department of the Interior what they think about this? If we are going to put out a Federal requirement that you say you agree with, and it is ours, do you want to be bound by both what we say and they say about this case -- whether they think you should be cooling the water or not? I don't know what they are going to say.

MR. BROWN: The permit says we will comply with any lawful order.

CHAIRMAN STEIN: I understand that. You indicate that you are actually improving the condition.

W. R. Brown

Now I know the Fish and Wildlife Service of the Department of the Interior would be delighted if you were improving the fish conditions or the conditions of the biota. The question I am getting at is what do you say we both go to them? You go to them and ask for an opinion, and let's see what they say. We will go along with them and see if we can follow their judgment on this.

MR. BROWN: I will tell you in advance, Mr. Stein, what they are probably going to say. I don't know this directly, but I have heard a rumor to the effect that the man in the Bureau of Commercial Fisheries is making a career project of trying to stop us from building the cooling pond.

CHAIRMAN STEIN: I am not talking about the Bureau of Commercial Fisheries. Let's go to the Bureau of Sports Fisheries. The people we deal with in the Interior Department have an Assistant Secretary for Fish and Wildlife and Parks. Presumably we can refer this question to them. I don't want to have any prejudgment. If you feel they have a prejudgment on the case -- I don't have any views on this, and I agree that

W. R. Brown

theoretically sometimes heating can be helpful. But the question is whether it is a fact in this case.

Now I would be willing to submit that for an advisory opinion. Would you have an objection if we ask him? And if you know the Bureau of Sports Fisheries in the Interior Department, my asking him isn't going to sway them one way or another. But you can ask them and let's see what they have to say. I look at it and I have no idea. I follow their advice very seriously.

MR. BROWN: Well, I am actually surprised that hasn't been done already. We submitted copies of all of our research work done by Texas A & M to Mr. Vanderhoof, and we understood that he was going to pass it on to Dr. Tarzwell, and Dr. Tarzwell last night --

CHAIRMAN STEIN: Dr. Tarzwell is on our staff. What I would like to do is get a Federal Fisheries expert in another Department.

MR. BROWN: This information that we are compiling can be submitted to anybody.

CHAIRMAN STEIN: Yes.

MR. BROWN: Incidentally, all of this research with the ponds and the tanks and the marine laboratory is

W. R. Brown

going to be done by Texas A & M; that is not going to be pigeonholed. Graduate students are expected to use the research as a basis for theses for master's and doctor's degrees.

You can submit the information to anybody that you want to, and the only limitation that I see is we are, of course, a public utility. What we spend has to go into our rate basis, so, in effect, we are spending our customers' money.

The permit says we will comply with anything that is reasonable, and I think that we are going to have to agree on what is reasonable. We think that we have done everything that we know of that we can do within reason. We want to work with you for this project is vital. I don't know what we are going to do if we don't have it.

CHAIRMAN STEIN: I am concerned about the delay. Let me understand you. When you say you are ready to comply with any Federal or State regulations, any "reasonable" Federal or State regulations, what you are doing is reserving for your company the right to determine what is reasonable.

W. R. Brown

MR. BROWN: I don't think that we would determine it.

CHAIRMAN STEIN: No, no. I thought that is what you just said.

MR. BROWN: No. I said you and I are going to have to either agree what is reasonable --

CHAIRMAN STEIN: If you and I are going to have to determine what is reasonable in the sense "it is the both of us," you are assuming each of us will have the veto power over the other.

MR. BROWN: I would assume if you and I can't agree on what is reasonable, we would let a court decide what is reasonable.

CHAIRMAN STEIN: Always, always, always.
(Laughter.)

That is why we are here. That is right.
I hope we can avoid that.

MR. BROWN: That is the last place I want to go.

CHAIRMAN STEIN: That is the last place I want to go, sir.

MR. BROWN: The thing that I am concerned

W. R. Brown

about really, Mr. Chairman, is delay. And delay is the thing that caused the crisis in the electrical field.

CHAIRMAN STEIN: Right.

MR. BROWN: We want to get on with it. We have already ordered the third unit. It is being manufactured.

CHAIRMAN STEIN: I don't want to get on this, but do you think the delay was caused by the Government, and that has caused the crisis in the electrical industry?

MR. BROWN: Yes, sir.

CHAIRMAN STEIN: "Yes, sir?" You don't think that is due to the lack of planning within the industry itself for the needs of power; you are going to pin that on the Government?

MR. BROWN: Mr. Stein, I can document projects that have been delayed as much as 10 years.

CHAIRMAN STEIN: All right.

MR. BROWN: Of course, it is a combination of the courts plus attitudes that some of the agencies have taken. Some of the Government Agencies have tried to unlock the jam. The FPC certainly has.

CHAIRMAN STEIN: Yes.

W. R. Brown

MR. BROWN: I am not trying to blame it all on the Government. But on the question of planning, I am just here to represent one company. We have never run short. We have always planned ahead. That is the reason we have never had an energy crisis in Texas, and I am concerned we don't have one in the future.

I know I am taking up too much time.

CHAIRMAN STEIN: Do you want to ask a question?

MR. VANDERHOOF: It will take some of the charges this gentleman has put forth, Mr. Stein, some time to --

CHAIRMAN STEIN: Can you summarize your questions? (Laughter.)

Hit the most pertinent ones.

MR. VANDERHOOF: Well, I believe this is such an important question and it is one of the reasons of this conference. I think Dr. Tarzwell should be heard as well as myself on this issue. I would like to ask a number of questions, Mr. Brown.

First of all: Have you had any conversations with the Federal Power Commission recently on your Cedar Bayou plant?

W. R. Brown

MR. BROWN: I haven't personally, but representatives of the company have a few days ago.

MR. VANDERHOOF: Do you know what these discussions concerned?

MR. BROWN: I haven't been a party to them, but I understand they are very much concerned about the possibility of the plant not being built on schedule.

MR. VANDERHOOF: You don't know then that they are concerned about the site location; that there are alternative sites?

MR. BROWN: That information has not been conveyed to me if they are.

MR. VANDERHOOF: Well, I have talked to the Regional Engineer of the Federal Power Commission, and he says that was the substance of his talk with your company. Now, let me ask some questions.

MR. BROWN: Why don't we have a meeting with him, and then we will find out for sure what he thinks.

MR. VANDERHOOF: I think that would be fine.

Tell me, when did Unit No. 1 go into operation at Cedar Bayou?

W. R. Brown/G. Simmons

MR. BROWN: It went into trial operation in December of 1970.

Any new unit of this size, Mr. Vanderhoof, has to go through a shakedown period and see, we are designing bigger units all the time to take advantage of the economy scale. It is not unusual for it to take quite some time before you really have it into full-scale operation. As a matter of fact, I think they have had to do some additional shakedown and corrective work on it.

MR. VANDERHOOF: Can you tell me when the Cedar Bayou plant was developed?

MR. BROWN: I would have to ask Mr. Simmons. I am not too good on dates.

MR. GENE SIMMONS

HOUSTON LIGHTING & POWER COMPANY

HOUSTON, TEXAS

MR. SIMMONS: I am not sure I can remember the specific time, but our first water permit was 1967. So I think back in 1965 would be a good rough time when we first started plan designs for it.

G. Simmons

MR. VANDERHOOF: All right. Then in 1965 you developed the concept of a huge Cedar Bayou plant, and I presume then that you went on to engineering design at that time?

MR. BROWN: I think Mr. Simmons is better qualified to answer.

MR. SIMMONS: Yes, sir, that's right.

MR. VANDERHOOF: All right. Then you arrived at some conclusions somewhere around 1965 that the engineering economics said, "Go" on Cedar Bayou?

MR. SIMMONS: We arrived at the conclusion this was the most feasible location for a powerplant site.

MR. VANDERHOOF: That was in 1965?

MR. SIMMONS: Roughly 1965.

MR. VANDERHOOF: Then in 1967 you contacted Texas A & M University -- a very fine university, and I certainly would believe anything they would say -- to do ecological studies?

MR. SIMMONS: Yes, sir.

MR. VANDERHOOF: Mr. Brown and Mr. Simmons, isn't this sort of putting the cart before the horse?

G. Simmons

That is, first of all, you make your engineering designs, then you have ecological studies developed to back up what you have already determined to do?

MR. SIMMONS: No, sir, I don't think so, Mr. Vanderhoof.

I think that the availability of the people and the emphasis and attention being given to this was not here in 1965. And I think that we were following the trend. I think we responded quite well to the attention that was required, and we made the move and contacted Texas A & M and made our contracts well ahead of the first unit of operation. And we had the study under way for over a year before the plant was ever put into operation.

MR. VANDERHOOF: But regardless of what the study found, the plant would still go in operation because you had already ordered the equipment, you had acquired the site?

MR. SIMMONS: What was that question?

MR. VANDERHOOF: Well --

MR. BROWN: I think that was more than one question.

G. Simmons

CHAIRMAN STEIN: Yes. May I suggest you ask just one question at a time.

MR. VANDERHOOF: Well, you asked me to summarize, Murray.

CHAIRMAN STEIN: Summarize, yes.

I think again maybe our professional bias is showing, Mr. Brown. I know the fastest way to get through any of these questions and answers on operation is just to ask one question at a time, and we will be able to move more expeditiously. We don't have strict rules of evidence here, but I think that is a good clue to follow.

MR. VANDERHOOF: All right. In 1965 your plant was designed, plans and specifications were developed, and you probably went out on bids for equipment due to the long leadtime.

MR. SIMMONS: No, sir. The plant site was acquired around 1965. The first unit went into operation in late 1970. This means that we made a commitment for the unit somewhere in the early -- sometime during the year of 1966.

MR. VANDERHOOF: Did you have the results of

G. Simmons

the ecological studies at that time?

MR. SIMMONS: No, sir, we did not.

MR. VANDERHOOF: How deep -- what is the average depth of Galveston Bay?

MR. SIMMONS: Galveston Bay? Oh, some 8 to 10 feet. Seven to 10 feet, possibly.

MR. VANDERHOOF: All right. I will accept the 7.

MR. SIMMONS: Trinity Bay is even more shallow. If you include Trinity Bay it is probably 6 or 8 feet.

MR. VANDERHOOF: All right. Now when you got the Cedar Bayou plant on line, the 5,000 megawatts, am I correct in assuming that the once-through cooling will require 5,000 cfs?

MR. SIMMONS: Yes, sir.

MR. VANDERHOOF: Now, during the critical season of any year, what would you say the average inflow into the Galveston Bay system might be?

MR. SIMMONS: The average inflow from all other water sources?

MR. VANDERHOOF: Yes, sir.

G. Simmons

MR. SIMMONS: I don't have that figure at my hand. It's in the engineering report, and I think it is included in your book here. If we have a copy of it, we can get it out of that.

MR. BROWN: Don't call it the black paper.

(Laughter.)

MR. VANDERHOOF: Well, you are correct. It is in the book.

Would that number be close to around 1,000 cfs?

MR. SIMMONS: I don't remember. I think that's the low figure.

CHAIRMAN STEIN: By the way, this is a conference. If anyone knows that number, why don't you reveal it? This isn't a cross examination.
(Applause.)

MR. VANDERHOOF: Well, the number is low -- is small by comparison of 1,000 cfs. The whole thrust of this question is that this immense plant is going to change the circulation pattern of Galveston Bay, and we do not know nor could you possibly know the damage that you might be doing. That is the thrust of that particular question.

G. Simmons

MR. SIMMONS: Mr. Vanderhoof, may I comment on that? I can't agree with you that the change in flow is necessarily going to be bad. There are a lot of other changes occurring in Trinity Bay and Galveston Bay, and I think that very conclusively the change in flow will be beneficial, and we believe this very sincerely.

Now I wish to remind you that we aren't talking about starting up this plant operation with 5,000 cfs. We are talking about starting it as it presently is operated at 750 cfs, proceeding in an orderly and a periodic fashion by the addition of units with a continual monitoring system, which will give us plenty of time to detect any changes in the environment that are occurring. And we feel confident these changes will show the 5,000 cfs flow benefit.

If it does not, we have got plenty of time to stop and reevaluate this with the operation of the first unit. The initial evaluation has shown that we have increased the amount of fish life in Trinity Bay.

MR. VANDERHOOF: You have already told me that you are committed to Unit No. 3 at Cedar Bayou.

G. Simmons

MR. SIMMONS: Yes, sir.

MR. VANDERHOOF: Well, what would happen if you did find out that the circulation was adverse to the marine life?

MR. SIMMONS: Then we would proceed to do whatever was required to alleviate and correct the situation.

MR. YANTIS: Mr. Chairman, there is need here for a statement by me to kind of straighten out some things.

There are powerplants built all over the United States in locations that are both wise and unwise. There was no agency, to my knowledge, in this State -- either Federal or State -- that in the remote past had any control or even any interest in where a powerplant was built. Almost without exception, I have never heard of anybody in the years past ever even being curious about where an electrical plant was built. It is just something that was there, like part of the ordinary geographical landscape. When this one first came up, the EPA was not consulted. There was no EPA. The FWQA was not consulted. There was no FWQA. The FWPCA was not

G. Simmons

consulted at first because they had no direct interest at that time. Neither did the Corps of Engineers, except as to defective dredging. The State of Texas was consulted as is required by State law.

We, ourselves, raised some questions upon the investigation of the Parks and Wildlife Department about what the temperature might do -- about what might be the effect upon fish -- and we made then some rudimentary evaluations. There was no one else who could have made any better evaluations at that time, so we made what we could.

We placed some requirements into the waste discharge permit that was issued, and I believe that they employed ecological consultants because we told them to. It was required because we knew that we had embarked upon a course of action that required thought and consideration and more knowledge than we had. Now, we didn't have much knowledge, but neither did anyone else. So, as this thing grew, we required more. We required that their consulting engineers do a simple computer study; do a heat dissipation study based upon some work at Johns Hopkins University.

G. Simmons

The Federal Government is familiar with some of that work, and we have some disagreements upon the meaning of it.

But we did make some judgments on the basis of this rather simple work. We also required of the power company, as time went on, that they engage in a very sophisticated computer study jointly with our Galveston Bay Study. We required that they employ a very fine ecologist and go into a much more difficult study.

The Parks and Wildlife Department was concerned that in the lower reaches of the Cedar Bayou -- and I used to live on Cedar Bayou, and I know what it looks like, and I know what it used to look like -- but we were concerned that the damage might be done to the lower part of the Cedar Bayou. So we required on the advice of the Parks and Wildlife Department that there be protection for that one. So this was done by having a canal not extend to the mouth of Cedar Bayou -- although there is a navigation canal in there now, and it may well be deeper, and this is discussed in the black paper -- but we required that the intake canal

G. Simmons

cut across country so as not to suck this water backward up Cedar Bayou. The original design showed a canal extending more or less westward to a point somewhere near where the waste would come out of the Houston Ship Channel. This was opposed by a number of people -- some State, some Federal. We required that the intake structure be switched 90° and run almost due south and way down toward the middle of the Galveston Bay, as was shown in one of the photographs. All of these things were required by the Government of the Houston Lighting & Power Company.

As we developed our expertise on this a number of conferences were had over and above the public hearings. I had one, a special conference in my office to which we invited every Agency, both State and Federal, and I believe local, to come to my office and sit around and talk about everything that anybody could possibly think about. There may well have been a second conference.

MR. BROWN: You had one in Galveston.

MR. YANTIS: I am talking about the one in my office. These were people in my office. Only one person continued to have a question and that was the man

G. Simmons

from the then Federal Water Pollution Control Administration. I don't recall the name of the Fisheries people, but I remember that as the conference broke up, he told me personally, "I don't know what that man is worried about. This can't possibly hurt the fish or wildlife of Trinity Bay."

So I think that we have, as Mr. Vanderhoof has asked his questions, overlooked entirely not only the history of how things used to be done but the progression of how we got to where we are, and the rather extreme care with how we got where we are, plus the assurance of the power company for what they will do if anything goes wrong.

Now I want to add this here, because I think there is a tendency to overlook the fact that there have been a lot of very competent people involved in this thing up to this point.

CHAIRMAN STEIN: You know, Mr. Yantis, you may be helping, but I just have to say something.

I do think the power company has proceeded in an entirely legal manner, and I want to make that clear. But there has been an Agency concerned on a Federal level with site selection -- the Federal Power

G. Simmons

Commission.

We have a similar situation here on the southern tip of Texas as we had on the southern tip of Florida, where for whatever reason, someone made arrangements whereby they are in a completely intrastate grid system and have not come under the Federal Power Commission. I don't condemn a company for doing that. That is completely legal.

We have these problems here now and I just alluded to that lightly. But I think if you want to talk about the history of how this has come about, we have to look at this.

Mr. Vanderhoof?

MR. VANDERHOOF: Yes. I have another comment upon Mr. Brown's description of land use. He urges the use of land for the highest uses. It obviously means industrial uses insofar as the land with the cooling pond is submerged. Now is this land or submerged land not in fact a good nursery ground?

MR. BROWN: It is my understanding that it is, and I understand that we expect to improve it and make it an even better nursery ground. Is that right, Mr. Simmons?

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MR. SIMMONS: Mr. Vanderhoof, I think if you will refer to some of the biological reports which we have taken to your office -- and sent additional copies to your office -- you will see the biological report indicates that is a nursery ground. It is not a prime nursery ground. There are some nursery grounds near it. Our intention in developing this pond will be to enhance the utilization of this area as a nursery ground. We are going to special precautions to be able to utilize a multi-level pond and to be able to adjust the level of the pond, so that it can be utilized to enhance the value of it as a shrimp-nursery ground and a fish-nursery ground.

We feel confident that can be done and will be done and that the area in question will be enhanced as a nursery grounds rather than losing value as a nursery grounds.

MR. VANDERHOOF: In the Trinity Bay, what is the ambient water temperature?

MR. SIMMONS: What time of the year?

MR. VANDERHOOF: The critical time.

MR. SIMMONS: I heard over the radio it was 82° or 83° this morning.

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MR. VANDERHOOF: At the critical time of the year, summer, which is likely the hottest part of the summer.

MR. SIMMONS: We have recorded samplings of Trinity Bay where the water temperature gets up to 94°.

MR. VANDERHOOF: And what is your permit?

MR. SIMMONS: 95°. When we talk about permits, we are talking about the ultimate plan, 95°.

MR. VANDERHOOF: Now is that within the mixing zone or without, beyond the mixing zone?

MR. SIMMONS: That is at the edge of the mixing zone.

MR. VANDERHOOF: Would you define what you think a mixing zone is?

MR. SIMMONS: Excuse me, I beg your pardon. That is at the discharge point. That is at the point of discharge into the bay. It is 95°.

The mixing zone exceeds out to 1-1/2° above the ambient.

CHAIRMAN STEIN: Pardon me.

Just forgive me in this. I know the question, but, I don't understand -- you say you are going to

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discharge at 95°?

MR. SIMMONS: Yes, sir.

CHAIRMAN STEIN: And the temperature in the water gets up to 94°?

MR. SIMMONS: Yes, sir.

CHAIRMAN STEIN: How are you going to just raise that temperature 1° to make that?

MR. SIMMONS: We are talking about an average temperature of discharge, and we are talking about a circulating water system, which takes a matter of days.

We are talking about 2 days in the pond, and at least 1 additional day of transit time involved in taking the water up Cedar Bayou and passing it through the plant.

CHAIRMAN STEIN: Maybe we can cut through this. You mean you have a system that can just raise the water 1° before you discharge it?

MR. SIMMONS: We have got a system which will raise the average temperature of it about 1°, yes, sir.

CHAIRMAN STEIN: Before discharge?

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MR. SIMMONS: Before discharge. Above the highest ambient for the day, yes, sir.

CHAIRMAN STEIN: And what is your Delta T on this plan?

MR. SIMMONS: We have a condenser which is designed for 20°.

MR. STEIN: You are just raising the discharge point 1°?

MR. SIMMONS: Now, don't forget, we have a cooling pond here, Mr. Stein.

CHAIRMAN STEIN: Yes.

MR. SIMMONS: Which is going to take out a significant amount of temperature from the cooling pond.

This is the purpose of the cooling pond -- to take the temperature out of the water before it goes into the bay.

CHAIRMAN STEIN: I understand that.

What you are saying is that at 94° -- well, you talk about "average." What are the extremes? How high? What is the highest you are going to raise that? The reason I am asking this question is that I am trying

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to cut through some of this. Maybe we don't have this big a problem.

MR. SIMMONS: Well, if you want to get into the specifics of the permit, our permit, as I recall it -- and I don't have a copy of it here -- our discharge permit is for the temperature at the point of discharge, where we go directly into the bay and it is 95° average monthly temperature, 99° average daily temperature, and 104° any instantaneous measuring time.

CHAIRMAN STEIN: I've got it.

MR. SIMMONS: This is 3 temperatures as I recall it, that is in our permit.

CHAIRMAN STEIN: He had better continue with his questions then.

MR. YANTIS: Let me ask a question. You went by me too fast. The piece of land on which the cooling pond is to be built will be owned by whom?

MR. SIMMONS: Owned by the Houston Lighting & Power.

MR. YANTIS: In fee simple?

MR. SIMMONS: Yes, sir.

MR. BROWN: Wait a minute. We have bought as much of it as we can buy. We are having to condemn

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some of it. Under the Texas law, we cannot condemn the fee. It is equivalent to the fee -- I guarantee you we will pay for the fee, but it will be an easement for a cooling pond which will permit us to inundate with water.

MR. YANTIS: All right. Thank you.

MR. SIMMONS: It will be owned completely. It will be private property.

MR. YANTIS: Well, the point I was trying to make here is: Without encouraging the loss of a nursery ground of any kind, this is an accidental value in this case, since it actually is a piece of private property, is that correct?

MR. SIMMONS: That is correct, yes, sir.

MR. BROWN: We have all the patents, Mr. Yantis, with us, and, the major part of them -- some of them go back before the days of the Republic. It has always been privately owned.

MR. YANTIS: All right.

MR. VANDERHOOF: Now you are taking water out of a relatively polluted area and discharging it into a relatively clean area. Is this not a violation of the Texas nondegradation policy?

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MR. SIMMONS: Mr. Vanderhoof, I can't agree with your first premise here. The area we are taking water from is not of a heavily polluted area. It is of similar water quality as to what Trinity Bay is where we are placing the water. This is why we went to the considerable expense and trouble to dredge the intake channel away from the Houston Ship Channel. And so we are taking water from Upper Galveston Bay.

MR. YANTIS: I would like to ask Mr. Vanderhoof a question. Does he really think we would have authorized it if we thought it was a violation of the State policy or of the State law? (Laughter.)

MR. VANDERHOOF: The State policy and the State law may not be identical to the Federal interest.

MR. YANTIS: I would rather have you answer my question yes or no. Do you think we would violate our own policies and own laws or not? Yes or no?

CHAIRMAN STEIN: Come on. You can ask yes or no, but he can answer it any way he wishes.

MR. YANTIS: Well, I would just like to say I personally take exception to the innuendo of a question like that.

MR. VANDERHOOF: It appears to me from the

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information I have that the water is being taken from a polluted area and being discharged into a relatively unpolluted area and a vital important nursery area, and this is my concern.

MR. YANTIS: You are concerned that despite the some years of consideration, the public hearings, and the staff conferences and the input of people on my staff and the other State agency staffs and quite a good bit of Federal staff -- you are still concerned that we made the wrong decision, and apparently have willfully violated some policies and some laws? And, Mr. Vanderhoof, I will tell you quite clearly I don't like your implication. (Applause.)

CHAIRMAN STEIN: Do you want to continue?

MR. VANDERHOOF: I think Dr. Tarzwell may have something.

MR. YANTIS: I understood when Dr. Tarzwell saw Galveston Bay yesterday he expressed surprise it was not 20 foot as he had thought but it was only 6 or 8 feet deep. (Laughter.)

CHAIRMAN STEIN: What is the draft of those vessels that come up there?

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MR. YANTIS: They go through a channel which is cut and which was created at Kenson Island.

CHAIRMAN STEIN: Yes. Cut at Federal expense, and the testimony has been that it was filled up by pollution.

MR. YANTIS: I will point out those Federal dollars came from taxpayers. (Applause.)

CHAIRMAN STEIN: To be used for taxpayers too, I hope.

MR. BROWN: We hope, Mr. Stein, they will, because we don't claim any credit for having collected them from our customers.

CHAIRMAN STEIN: Let me ask one question, and I really want a clarification on this. This is for you, Mr. Yantis. Do I understand that since you own certain properties or the beds of that property the question of whether there is a fish nursery there and whether you are injuring the fish nursery, as long as you own the bed of property, is not the concern of anyone except yourself? Is that the point? I am just asking about this.

MR. BROWN: It so happens, Mr. Chairman, that there has been litigation over this particular

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piece of property. There is a reported decision by the Texas court in which it is held to be private property.

CHAIRMAN STEIN: No. I am not arguing about that.

MR. BROWN: The court held the owner could prohibit anybody from coming in and hunting.

CHAIRMAN STEIN: What I am suggesting is that if this were private property and you had public waters over it, and there was a fish nursery in these waters where the fish would go out into other waters. You could do whatever you wanted in those waters as long as that was private property?

MR. YANTIS: Well, since I am an engineer I will answer that. Therefore, I don't have to be held accountable for the nuances of the law. But, in this State -- and I think in many States -- be it wise or unwise, be it moral or immoral, if a man wants to fill up his piece of submerged property, he can do it. It is law. Now, it may be against what the public would like to see, or against what I would like to see, but it can be done under the law, and it is done under the law in a great many subdivisions around Texas, and they are built that way.

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It is most controversial and you can get into some very good philosophical arguments as to whether that ought to be the law. But it is the law, as I understand it.

CHAIRMAN STEIN: Mr. Yantis, I am really here trying to seek information. That is not quite the question I asked.

The question is that if there is water over that property, can you do anything you want in destroying a fish nursery there if when they leave the nursery, the fish would get out into other public waters?

MR. SIMMONS: Mr. Stein, I think you missed the point I was trying to make earlier. We are concerned about the area being utilized as a nursery ground.

We are going to considerable trouble and expense of designing this pond in such a manner that it will still be utilized as a nursery area and nursery ground, and the value of it and the use of it will be enhanced over and beyond what is presently being used.

CHAIRMAN STEIN: I understood your point. But I believe Mr. Yantis made this point -- he said

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that since this is private property and this was a nursery, even though it were damaged, we wouldn't have an interest.

Again, I am not arguing the point; I am just asking for an explanation of the point. Maybe the law has been settled on that, I don't know.

MR. BROWN: You are getting into an area of the law that certainly has some gray areas and complexity. In the condemnation cases that we are having, one of the major property owners says, in placing a very high valuation on his land, he intends to convert it into a barge storage area, so all of the people in Texas assume they can do what they want to with it.

CHAIRMAN STEIN: Right.

MR. BROWN: I did say there has been one litigated case about this very body of water.

CHAIRMAN STEIN: All right. Thank you.
Do you have anything else?

MR. VANDERHOOF: Now, the information available to me says there will be a great increase in salinity, due to pumping of the water from Ceder Bayou

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through Trinity Bay. Is this correct?

MR. SIMMONS: Mr. Vanderhoof, I don't know where you get your information. But in the reports -- one of the reports which we took to your office and which we have sent you an additional copy of the report -- it is demonstrated what we have done to exercise a mathematical model to investigate this very point that you are raising. Any increase in salinity in Trinity Bay in that report indicates the increase in Trinity is insignificant and will have no appreciable effect on the marine life in Trinity Bay.

MR. VANDERHOOF: One other question.

MR. YANTIS: May I interrupt? I started to, and that is why the people started laughing.

MR. VANDERHOOF: You are breaking my chain of thought, Hugh. Unless you have something important to say ---

MR. YANTIS: All right. Go ahead.

MR. VANDERHOOF: You have stated that the water coming out of the proposed nursery is about 95° on the average, and probably, if I understood you correctly, there will be higher temperatures. Can you explain or

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tell me how a nursery can be developed with those temperatures?

MR. SIMMONS: Yes, sir. The temperature is not going to be that temperature throughout the pond. There are going to be shallows where the temperature will be less. The shrimp spawn and live in the shallows in the grassy area. This is where the shrimp will be.

MR. VANDERHOOF: A series of questions on cooperation, and I do apologize, Mr. Simmons, for not getting Dr. Tarzwell down here previously. We have had some organization problems, but I hope these are over. But, now on cooperation. Did you inform the Federal Pollution Control Administration when you started your monitoring program at either the intake or the outflow of the Cedar Bayou plant?

MR. SIMMONS: Copies of these were made available for them. I am not sure when they were transported or if they were not. Under the terms of our Corps of Engineers permit, we submitted these reports to the Texas Water Quality Board, and they then passed them on to the other interested agencies.

MR. VANDERHOOF: All right.

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MR. SIMMONS: These reports were sent to the Water Quality Board for transmission to the agencies.

MR. VANDERHOOF: For your information, we did not have knowledge that you were starting your program. Now did you seek to coordinate any aspect of the monitoring program with the then FWPCA or EPA?

MR. SIMMONS: We have been in touch with the local offices, the FWQA, really, since the inception of this, and the local office has been very cognizant of what we are doing in this area.

MR. VANDERHOOF: Now you have made a point that you are adding oxygen to the Trinity Bay. Is there, in fact, a deficiency of oxygen in Trinity Bay?

MR. SIMMONS: I don't know that I can answer and really say what is a deficiency or not. I would be inclined to say yes there is a deficiency in oxygen there, but it depends on what you mean by a deficiency.

MR. VANDERHOOF: Mr. Stein, I request that we give Dr. Tarzwell an opportunity to talk.

CHAIRMAN STEIN: On this subject?

MR. VANDERHOOF: On this subject, yes. He

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must return. (Laughter.) To Narragansett.

CHAIRMAN STEIN: Do you have any objection to that?

MR. YANTIS: I have no objection, but I wonder if we ought not to go ahead and have our rest break. It is well overdue and the stenographer says, "Please do."

CHAIRMAN STEIN: Well, if there is no objection, we will hear from Dr. Tarzwell when we return. May we try to keep this really to 15 minutes this time?

Thank you.

(Whereupon, a recess was taken.)

CHAIRMAN STEIN: Please take your seats.

MR. VANDERHOOF: I would like to introduce Dr. Clarence Tarzwell of our National Marine Water Quality Laboratory at West Kingston, Rhode Island.

DR. TARZWELL: Mr. Chairman, conferees, ladies and gentlemen. I believe there are some items that should be clarified.

First, in regard to my talk on Monday, I would like to point out it was extemporaneous, and I

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stated that I would talk on 3 subjects.

No. 1. Possible effects of thermoelectric generating plants. I listed 5 and a possible 6 effects of such plants. In this listing I was not dealing with the Cedar Bayou plant, but thermoelectric plants in general, and that is why I spoke of toxicity from fly ash, and also possible effects of radioactivity.

My second subject was some of the recommendations and suggestions of the National Temperature Committee.

As my third item I said I would make a few brief remarks concerning the Cedar Bayou plant.

It is difficult to know where to begin. However, the statement was made that we hadn't thought about temperature until fairly recently.

I would like to review the record. In 1952, as a member of the Aquatic Life Advisory Committee of ORSANCO, I participated actively in suggesting temperature and other water quality standards which were adopted by the Ohio River Valley Sanitation Commission.

In 1957, I published a paper on water quality requirements in which temperature was very prominently mentioned.

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During 1960 to 1962, I was a member of the Pennsylvania Temperature Committee, the mission of which was to establish water quality requirements in regard to temperature, primarily for thermoelectric plants. This question of temperature and the effects of the discharge of heated waste from thermoelectric plants is not new. We have been considering it for many years.

True. I have been in Houston only once since I was here in late February 1938. But I did not state when I saw the bay yesterday that I was surprised it wasn't 20 feet deep because I had looked at the charts of the bay and I saw what the depths were. I was especially interested in the depth of Trinity Bay.

Now, as to some of the effects and some of the items that should be taken into consideration, in determining the advisability of the Cedar Bayou plant, I have read the Copeland Report which is a report on this subject prepared for the Houston Lighting & Power Company.

In that report, it is stated that a possible adverse effect of the transfer of water from Cedar Bayou to Trinity Bay would be an increase in salinity, and there

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was some concern expressed as to whether it would have some adverse effect on the blue crab.

I am informed that oil wells are discharging brine into Cedar Bayou and I have read a report that states there is stratification in the bayou; that salinities run as high as 10.4 to 10.5 parts per thousand in the bottom of Cedar Bayou and that oxygen levels are down to zero over considerable areas.

Therefore, the concern about the possibility of high salinity in the intake water is because there will be high salinity waters coming from upper Cedar Bayou. These waters will be mixed with other waters coming from the lower portion of Cedar Bayou. Dissolved oxygen is reported to be lower here and is down to zero in certain bottom areas at some times.

However, the Houston Lighting & Power Company feels that with the goals they have set they will probably restore the oxygen. This is possible. It may be done.

Another consideration is the fact that there is a steel company discharging its wastes in the lower portion and they are drawn up the channel and into the

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plant. Also, while the Mobay Company does discharge its waste further down, they still discharge into a water area which the currents bring up into the plant.

We know that wastes from steel plants are toxic. We have carried on studies in years past and have determined this under field and laboratory studies. We had a very good example of this during the steel strike of some years ago in studies that we made on the Ohio River at Cincinnati.

For these reasons there is evidence, and enough evidence, to make us inquire, why should we take water from an area where there is polluted water and put it into an area which has been designated as the prime nursery area of Galveston Bay?

The Copeland Report lists several nursery areas, among them the area of the Robinson plant, but Trinity Bay is a prime nursery area according to the Copeland Report.

Another thing that gives me concern is that when the plant is in full operation, discharging 5,000 cfs, this outfall for some 46 percent of the time will be greater than the flow from the Trinity River,

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according to the records in the engineering reports that have been put out by the company. This will change some of the flow patterns.

The Copeland Report also shows that there is going to be considerable flow to the south around the point with resulting recirculation. This is going to change the currents, and there is some apprehension displayed in the Copeland Report about what effect this might have in recirculating the organisms.

It is entirely possible that this can occur, and it is entirely possible that under certain conditions there can be a buildup of temperature with the recirculation.

Now as to the mixing zone in Trinity Bay -- this is a wide bay; it is not a river or a long narrow estuary, as were under consideration by the committee when they suggested zones of passage which in turn defined mixing zones.

The committee did not have such a body of water in mind when it defined zones of passage and mixing. It did not have in mind allowing 25 percent of

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the surface area or the cross sectional area of such a body of water as a mixing zone. If we should follow this approach, it would be the same as saying 25 percent of the width of Chesapeake Bay, or maybe even 25 percent of the width of Lake Michigan.

The committee had in mind a stream with a current or a long narrow estuary that has a current, and they did not consider this as applying to such an area as Trinity Bay.

Twenty-five percent of the distance across Trinity Bay is somewhere between 2 and 2-1/2 miles. I measured it on the map at the widest part and it was almost 10 miles.

I think it stated in one of the reports that in the area of the effluents the bay is 42,000 feet across. This would mean that it is about 8 miles. Twenty-five percent of that distance is 2 miles. In short if we take this approach, the mixing zone will extend 2 miles out into Trinity Bay.

If you will read the recommendations of the National Technical Advisory Committee on water quality requirements for fish and other aquatic life and

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wildlife, you will find that we state the zone of mixing is for mixing only and it is not for treatment, and that mixing should be accomplished as soon as possible and in as small an area as possible.

Now, as to kills of entrained organisms, the studies carried on for the Houston Lighting & Power Company and described in the Copeland Report to determine the killing of entrained organisms were carried out from late in October to March -- the winter months.

I stated Monday that the kills occurred during times of critical stress due to temperature -- for example, in July and August. In the 2 plants which we have studied, we have found that during periods of chlorination the kill of entrained animals was 95 to 100 percent. There is chlorination at the company plants and in the engineering report of the company, it states chlorination is to be at 10 to 13 ppm with a residual of .1 ppm.

One-tenth of a ppm of chlorine is toxic to some aquatic life. Further, you do not have to have residual or free chlorine in order to kill because when

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you chlorinate at 10 to 13 ppm, you are going to have chlorinated materials which are toxic and at least some of which are more persistent than the free chlorine.

Chloramines are toxic. Other chlorinated materials are toxic also. So, there are residual and long term effects of chlorination.

Now as to the entrainment kills due to temperature. In the absence of chlorination during periods of high temperature during July and August we have found kills of phytoplankton, i. e., the plant plankton, the algae of various kinds, of 50 percent; among the zooplankton the kill was 85 percent.

Studies on the effect of entrainment have been made at the Robinson plant -- I was down there last night and I asked: "Do you get kills? How do you take your samples?" I was told that samples are taken at the immediate outfall and that a visual examination is made for zooplankton in a glass jar by holding them up to see if they are alive.

We have done this too. Generally there are many alive. However, they don't stay alive when they are exposed to heat in the plume or in a canal. We

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have carried on studies of the effects of elevated temperatures after the shock of going through the condensers, and we have found that when they are exposed to heat in this way during periods of high summer temperatures, conditions are critical and were lethal to some 85 percent of the zooplankton at one plant.

They cannot stand that heat after the exposure in the condensers. This is the critical thing.

The proposed plant on Cedar Bayou is to have a 6-mile-long discharge canal which is going to result in the entrained organisms being exposed to high temperatures for a considerable period. It is understood that cooling water will be 20°F. above ambient, and ambient runs 90° to 91° very often at the peak temperature periods.

It was stated here just awhile ago that ambient temperature in the intake canal can be as high as 94°F. When you add 20°F. onto that you are going to find very few organisms that can take it.

This is not fancy. We have studied these plants. We have studied one plant in the critical summer months, and our studies on another one are going

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into the second year.

Further consideration should be given to chlorination in wintertime. We know fish are attracted to these heated areas in plant effluents, and it was mentioned how the fishing is popular in such areas. It should be made clear that this is in the winter, not in the summer. During the winter and early spring when fish concentrate in the warm water from the plant, they have been killed by the chlorine emerging from the plant.

In fact, one plant stopped chlorination because the kills were getting so large this spring.

Now as to the proposed cooling pond. Some reference was made to this being a nursery. In the Copeland Report, there are some contradictions and some things that are not clear to me. Forecasts have been made of the things that will be accomplished through the use of the proposed cooling pond as to cooling, production of marine life and oxygenation. I would say that the probability of the forecasts being correct is very improbable.

In this nursery or cooling pond, it is

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stated that the biota are going to purify wastes. When you purify wastes through bacterial action you use up oxygen. That is going to reduce the oxygen level in that pond and low levels may occur during periods of darkness. It is also stated there is going to be purification though settling out. We have heard of the metals and other toxicants in the water used for cooling and it has been stated in the Copeland Report that the toxicity seems to be in the suspended materials.

If these materials settle out in the pond, there is going to be a concentration of toxicants on the bottom.

Furthermore, it was stated that this pond would produce a great deal of marine life because the water was warm. True it will be warm and shallow. It was pointed out that nutrients would come in with the water. There was some concern about the renewal of the nutrients, but it was stated that there were many nutrients in the water of the Ship Channel and that nutrients would be brought over from the Ship Channel.

At another place in the Copeland Report, it is stated that water from the Ship Channel would enter

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the intake canal only about 3 percent of the time.

If you don't bring it over, you can't use it, and, if you do bring it over, you can get into trouble due to low oxygen levels and toxicity. So, this is like the horns of a dilemma, it seems to me.

It has been our experience that when we have high temperatures and high nutrient levels, we get algal blooms --. This bay and the proposed pond area are rich. I have examined the tables listing the amount of nitrates and phosphates and other nutrients in the water, and I was struck by the tremendous amounts of these materials reported as being present in the water. I seldom see such high levels. It made me wonder if the analyses were correct. When you have high nutrients and high temperatures, the algae that you get is generally bluegreen. They are the least desirable from the standpoint of food for other organisms.

Another group of algae that comes in is the coccoid greens, the very, very small algae. These are so small that they can't be used as food by oysters.

This is what happened in Great South Bay up at Long Island due to the nutrients from the duck

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farms. The duck farms, of course, had a very potent waste, as you know if you have ever put poultry manure on your garden.

In Great South Bay there was a dense growth of algae, but it was the coccooid greens, and they were so small that the oysters couldn't utilize them. They passed right through their gill structure, their straining structure, and they couldn't collect them.

Here they were starving to death in a pea soup because it wasn't the right kind of food. Such an occurrence must be considered in this proposed cooling pond. "There is many a slip between the cup and the lip."

In determining whether or not you are going to have a successful marine nursery, there are things to look into and consider. I hope that it would be successful. It would be wonderful if it was.

But I cannot, as a biologist, refrain from saying, "Gentlemen, you better look at quite a few things. There are quite a few pitfalls here."

Now, as to the temperature problems.

With a large discharge such as this entering an area of shallow water, there is going to be an

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increase in temperature over a considerable area.

The location of the effluent plume, as shown in the Copeland Report, as I understand it does not agree with the U. S. Army Engineers studies which were actually carried out to show where the plume would be.

I understand that the plume moves around with the winds and currents and is quite variable in its location. It can influence a considerable area.

Even the one shown in the Copeland Report is almost 2 miles out into Trinity Bay and extends almost 12,000 feet along the shore. It can shift with the tide.

As I see it, all of Trinity Bay is a nursery area. It is important for the rearing of organisms of recreational and economic values. I can't understand how the area just where the effluent is to be discharged would not be considered as a prime nursery area when the areas all around it are. This area is in the upper end of the bay. So we have to consider I think the whole area as a nursery area.

It may not be a nursery for certain species,

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but we must consider organisms other than the 6 species that have been discussed in the Copeland Report; namely, 2 species of fish, croaker, and spotters, and the blue crab, and menhaden.

There are other species of fish and food organisms which must be considered. What are the temperature requirements for these organisms? This is important.

If you don't have the food organisms, you are not going to get the organisms that prey on them.

Furthermore, the average conditions don't tell you much -- unless you define the limits. Without them averages are rather meaningless.

For example, did you ever hear about the man that drowned wading across a wide stream that had an average depth of 2 feet?

It is the extremes that are important biologically and these are what must be taken into consideration.

You only have to kill a fish or any other organism just once, and, if conditions are unfavorable 3 percent of the time, they might as well be unfavorable

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most of the time. You couldn't quit breathing 3 percent of a year and survive.

Many of the important marine organisms spawn only once, in the late spring and early summer, and many of these have early life stages which are planktonic.

This means they float freely in the water and move with the currents. Among these planktonic forms are the larvae of the arthropods, including the shrimp and the crabs.

The larvae of the clams, the oyster, the mussels, and the scallops, which occur more in other areas, and the larvae of the worms which are important as food in the marine environment, all are planktonic.

If those go through a thermal electric plant and are exposed to high temperatures, they could be damaged beyond repair. Even though a good percentage of them did not go through, after long periods, there would be damage appearing, a slow deterioration.

MR. YANTIS: Excuse me. Let me ask Dr. Tarzwell a question.

Doctor, how much more time do you think you will need? I am very concerned about the length of time of our presentation. We have been 2 hours on this one.

Dr. C. Tarzwell

DR. TARZWELL: All right. Two minutes.

MR. YANTIS: All right, sir.

DR. TARZWELL: I will summarize.

Let me say this: I have looked at the location of the plant, the intake, and the discharge canal. Judging on my experience, what I have seen, and what I have studied, I feel that this Cedar Bayou site is a poor one because this discharge is into water having an average depth between 6 and 7 feet. In addition, the receiving water is a nursery area. I don't see how it is possible to avoid problems that are practically impossible to meet.

I feel that the site is a poor selection. I feel it is to the disadvantage of the company to locate in such an area if they operate as planned. If they really examine the facts and look into all the costs which will be required for the protection of the environment, I feel they may wish to change their plans.

Now my interest is for the people of this country, for the conservation of our natural resources, for the protection of our environment, for the protection of our national marine resources, our national water

Dr. C. Tarzwell

resources, which are so important to the future of this Nation and the feeding of the people. It is for this reason that I am so concerned about items which I feel will hurt the country or the resources and mistakes which I feel should not be made. (Applause.)

CHAIRMAN STEIN: Dr. Tarzwell, thank you very much.

As you can tell from Dr. Tarzwell's talk, and as you probably know, the thermal discharges are probably the hottest item in our country now. (Laughter.)

But for purposes of the conference, I would suggest that if we are going to get through and if this is agreeable with the other conferees, we won't have other speakers, Mr. Yantis, on this. Then we can continue.

This may go on for some time. We will reserve time at the end of the conference for a thorough explanation or exploration of the thermal discharge question.

But I believe if we are going to pursue it now, it is just going to take over the whole conference.

Dr. C. Tarzwell

The people who have come here at great sacrifice to their own schedules won't have time to get on. I think we have to make that ruling if we are going to proceed in an orderly fashion.

MR. YANTIS: Now, Mr. Keck, I wish you would prepare to call your next speaker. I do not wish to have another speaker on heat. I think we got off the temperature question when he brought up United States Steel. I doubt that Dr. Tarzwell has any knowledge about that permit or what is in it. It is not a typical steel company permit. It is most rigorous. I think some of his facts about chlorinated materials could certainly stand extension.

This has nothing to do with heat. It could even involve itself with whether the city of Houston ought to chlorinate or not.

We also have some question about the amount of effect in Trinity Bay. We think the mixing zone is 2 percent, not some larger figure. If we are going to debate every question that comes up, we will be here literally for months, and most of these questions have been debated in the past. All of us, including the

Dr. C. Tarzwell

Federal Government, are going to have to use some discipline in the amount of questions that follow every presentation. Because if we do raise a controversial point, we have got no choice -- we either pursue it to the end, or don't raise it in the first place. That means there is no end to this conference ever.

I think we should allow the industries to make their presentations without any particular amount of questions, and then let the conferees, in whatever way they wish, determine the validity of the things that have been said. That is the only way we will ever get finished. We have already run half way into tomorrow with the presentations that ought to have been finished today.

CHAIRMAN STEIN: May I just say one thing, and I say this for the conferees -- all of them. I hope I am not talking too much as a lawyer. The questions I am trying to ask are clarifying questions and not questions to probe the validity or nonvalidity of controversial issues.

I would agree with Mr. Yantis if we can limit ourselves to clarifying questions that will help

E. DiCorcia

us, we will be all right.

MR. KECK: With the permission of the conferees, I think we can get 3 companies in before 5:00 o'clock.

First I will call on Humble, then Atlantic Richfield, and then Armco.

Humble Oil and Refining Company and Enjay Chemical Company, we have Mr. Ed T. DiCorcia, Plant Manager of the Humble Oil Baytown Refinery, and he is eager to speak. (Laughter.)

MR. EDWARD T. DICORCIA, MANAGER
HUMBLE OIL & REFINING COMPANY'S BAYTOWN REFINERY
BAYTOWN, TEXAS

MR. DICORCIA: That is obvious.

Dave, thank you very much.

CHAIRMAN STEIN: He is eager to get up.

MR. DICORCIA: Chairman Stein, conferees, I am very grateful for the opportunity to make my presentation which I have been waiting to do since Monday. (Laughter.)

Ladies and gentlemen, my name is Edward T.

E. DiCorcia

DiCorcia, and I am currently Manager of Humble Oil & Refining Company's Baytown Refinery. In response to the Texas Water Quality Board's invitation of May 24, I have been asked to present to this conference pertinent general and detailed information on the effluent treatment and control program at both Humble's Baytown Refinery and the affiliated Enjay Chemical Company's Baytown plant. Our willingness to participate in this conference reflects both companies' interest in maintaining and improving the quality of neighboring Galveston Bay for multiple uses such as recreation, fishing, and commerce. Thus, we would like to describe briefly both our efforts and our results in water conservation and thereby contribute to the goals of the conference.

Humble's Baytown Refinery and the Enjay Chemical Company's Baytown plant are located on the Houston Ship Channel midway between the San Jacinto Monument and Morgan Point and share a common effluent treatment system. The refinery is one of the largest in the country, processing over 300,000 barrels per day of Texas crude oil to produce a wide range of

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petroleum products. Daily production of gasoline is over 5,000,000 gallons, or enough to supply the everyday fuel needs of about 2,000,000 American motorists. Baytown Refinery also supplies large quantities of distillate heating oils to consumers on the East Coast and is the world's foremost producer of lubricants and petroleum solvents. The chemical plant produces a variety of chemical products from petroleum feed stocks. Among these products are polypropylene plastics, butyl rubber, and intermediate chemicals used widely in the manufacture of synthetic fibers.

Because Humble and Enjay have a large petroleum and chemical manufacturing job to do, a large amount of water is necessary to our operations. The use of water in direct contact with oil has been reduced to a very small amount, but over 800 MGD of water are required for cooling purposes and steam generation. Because we have constructed an extensive system for recirculating water through cooling towers, and other water reuse projects, we have been able to reduce our water effluent to approximately 20 MGD. The effluent after treatment flows into the Houston Ship

E. DiCorcia

Channel in the vicinity of the Baytown-LaPorte tunnel.

In order to minimize the entry of oil into this 20 MGD of industrial water effluent, 28 unit oil-water separators have been installed adjacent to various processing units. We also have facilities to remove hydrogen sulfide from sour water streams before they enter our effluent treatment system. This sour water stripping unit, which was installed in 1952 and expanded several times since then, is especially important to water quality at Baytown because we must recover relatively large amounts of sulfur naturally occurring in the crude oil we process.

An industrial water collection system carries our effluent to a multistage primary water treatment facility, consisting of three pre separators and a large master separator, which holds a 10-foot water depth and covers over two acres. In this separator, mechanical equipment continuously sweeps oil from the surface of the water for recovery as well as removing silt which settles out of the water. Water from the master separator, combined with primary treated tanker ballast water, flows down a 3,500-foot-

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long canal with 6 additional stages of oil skimming to remove the last trace of free and floating oil before the water enters the secondary treatment facilities.

We began secondary water treatment in 1964 with the construction of an extensive natural lagooning system consisting of 3 large lagoons. The first lagoon covers 175 acres and retains the effluent water for a period of 10 days. The second lagoon covers 70 acres and provides 2 days of effluent retention time. The third and final lagoon covers 105 acres and provides an additional 3 days of retention. Thus, the natural lagooning system covers a total area of 350 acres and holds the effluent for a total of 15 days of natural biological treatment. The relatively small amounts of dissolved oil remaining in the plant effluent when the water reaches these lagoons provide nourishment for a thriving ecological system. Algae and sunlight combine to manufacture oxygen which, in turn, is used by bacteria in converting the hydrocarbons to harmless carbon dioxide and water. In 1967, the capacity of the Baytown plants' secondary treatment system was substantially increased by the installation

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of an 8-acre aerated lagoon upstream of the first natural lagoon. The aerated lagoon utilizes 32 floating, 60-horsepower motordriven aerators. The aerators greatly enhance the biological treatment process by enriching the water with 80,000 pounds of oxygen each day. The water from the last lagoon of this secondary treatment system finally flows to the Ship Channel. Thus, both industrial water and oily ship ballast water receive primary and secondary treatment in the manner described. We do not use injection wells or deep sea disposal of any kind. In addition, the sanitary waste of the 3,500 employees working in the plants and in the adjacent research facility is collected in a closed system for treatment in an on-site trickling filter plant of ample capacity. The effluent from this sewage treatment plant is also combined with the industrial water just downstream of the master separator and passes through the full lagooning system.

While Humble and Enjay at Baytown have extensive wastewater treatment facilities, we believe people are also a key factor in our water conservation efforts. It takes the equivalent of 94 employees full

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time to operate, maintain and do the other work associated with the plants' effluent system described. We hold all employees responsible for contributing to the water quality program, starting with the men actually working on the units and including all levels of supervision. A significant part of technical staff effort is devoted to engineering water quality improvements to our existing facilities and planning for protecting water quality in our new facilities. We feel that our employees at Baytown Refinery and Chemical plant are water conservation minded. A series of meetings plant-wide have been conducted to describe proper environmental control practices and to suggest ways in which each employee can assist in conservation efforts. We feel that increased employee awareness has contributed to an improved effluent quality.

In the area of new technology, a water quality monitoring procedure using a total oxygen demand analyzer and a gas chromatograph was developed by Humble and Enjay at Baytown in 1969. This was described in a paper presented at the Texas Water Pollution Control Association Conference in July of 1970 and thus made

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available to all industry and government.

Normally, the chemical oxygen demand, COD, and biochemical oxygen demand, BOD, tests are used to characterize water quality. We found, however, that these tests were inadequate for monitoring inplant discharges because they do not provide rapid feedback and give no identification of the components involved.

Therefore, our goal was to find instrumentation that would quickly and effectively indicate the level of organic loading and identify the contributing sources.

The system that was developed to monitor the quality of the untreated water made use of a total oxygen demand analyzer, which can measure the oxygen demand in a water sample in 3 minutes. This compares with 2 to 4 hours for the COD test and 5 days for the standard BOD test. The Baytown Enjay Laboratory developed a gas chromatographic procedure that identifies the components in a water sample in less than 1 hour. Joint use of the total oxygen demand (TOD) analyzer and the gas chromatograph has given the Baytown plants a water monitoring tool that we feel is

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quick and reliable. This technological advance makes it possible to detect in a relatively short time any plant malfunction that causes a high organic loading. By quickly identifying the source, it is then possible to get the specific problem corrected and thus avoid overloading the treatment system.

Let us turn now to the water quality results we have achieved. Our primary treatment facilities reduce oil concentration to about 40 ppm at the inlet to the lagoons. This remaining oil is consumed by the aerated and natural lagooning system. This is confirmed by infrared analyses which are conducted routinely on the final effluent flowing from the lagoons to the Ship Channel.

The lagoons are effective in reducing BOD and COD. The BOD and COD of the water entering the lagoons are reduced by 90 percent and 75 percent, respectively, to levels below those specified by our State waste control order. Very importantly, an extended series of bioassay tests assure us that our final effluent is not toxic. The holdup time provided by the lagoons also reduces the effluent to ambient temperature. I

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would like to clarify one other point regarding the quality of our water effluent. Contrary to the statement on Page 6 and the table on Page 74 of the EPA Galveston Bay report of March 1971, our effluent does not contain significant concentrations of heavy metals. Metals concentrations in the effluent are not much different from those in the freshwater influent and are within the limits of our waste control order.

In addition to the quantitative results I have mentioned, an interesting qualitative aspect of our treatment system is the fact that numerous shore birds and water fowl congregate at the lagoons. A 1971-1972 National Geographic Special Publication entitled "As We Live and Breathe" features on its cover a photograph of these birds. In addition, large numbers of fish are often observed swimming around our outlet to the Ship Channel, apparently attracted by the plankton and relatively high dissolved oxygen in our effluent.

Still, we are not satisfied. We are continuing to work actively on effluent quality improvement. For example, we share a problem that is common to all

E. DiCorcia

industrial plants as well as municipalities because it is possible for heavy rains to overload our treatment facilities. This is one of the areas in which we are planning further improvements. The engineering phase of a major project to collect and treat additional rainfall runoff has been completed, the funds have been appropriated, and we expect to start construction on the facilities in the near future. After completion and startup early next year, we will have a highly effective system for treatment of rainwater.

Overall, we feel that our water effluent at the Humble and Enjay Baytown plants is not detrimental to shellfish harvesting in Galveston Bay. We believe we have made significant progress in water quality management; however, our goal is continued improvement. (Applause.)

CHAIRMAN STEIN: Any comments or questions.

(No response.)

You know, some of the people here want to speak to the people of Texas and not to the conferees and the Chairman. Maybe Humble associates itself with that approach. I also notice the press got a

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distribution of your paper, but not the panel.

Thank you.

MR. DiCORCIA: I will file a complete one.

CHAIRMAN STEIN: Thank you very much. I also share the notion in hearing your talk and the one before this, that maybe what we should do when we plan a fish hatchery or bird sanctuary is set up a powerplant or a refinery to attract them. (Laughter and Applause.)

MR. DiCORCIA: Mr. Stein, I think your statement stands on its merits. (Laughter.)

CHAIRMAN STEIN: I made it to stand on its merits.

MR. DiCORCIA: Would you like to see a picture of the fish and birds --

CHAIRMAN STEIN: My daughter works for National Geographic, and I have that publication.

MR. DiCORCIA: I am prepared to demonstrate visually all of the conditions I described.

MR. YANTIS: Please ask your next speaker to give a copy to the reporter.

MR. KECK: As a matter of fact, she asked me to, but I forgot. This is the only time I had a

C. W. Robinson

chance to be up here since she asked me.

Next will be C. W. Robinson, Jr., Manager of Atlantic Richfield. He is now making distribution.

MR. C. W. ROBINSON, JR., MANAGER
HOUSTON REFINERY OF ATLANTIC RICHFIELD COMPANY
HOUSTON, TEXAS

MR. ROBINSON: Thank you, Dave.

Mr. Stein, conferees and ladies and gentlemen.

I am Charles W. Robinson, Jr., Manager of the Houston Refinery of Atlantic Richfield Company. Our refinery is located at 12000 Lawndale Avenue, Houston, Texas, with dockage on the Houston Ship Channel. In order to give some idea of the scale of this operation, our refinery processes some 225,000 barrels per day of petroleum crude oil and converts this crude oil into gasoline, heating oil, lubricating oil, and many miscellaneous products, not only supplying our markets in the Gulf Coast area, but to also augment supplies for our marketing operations in the midcontinent and east Coast areas.

It is fully realized that it is a tremendous task for the Environmental Protection Agency to compile

C. W. Robinson

a report on the vast estuary system of the Galveston Bay and its tributaries. Your March 1971 report states that Atlantic Richfield's refinery is permitted to discharge 8,100 pounds per day of oil into the Houston Ship Channel. I would like to point out that permits issued by the Texas Water Quality Board for our refinery restrict release of oil to levels much less than in the report and actual discharge of oil from the refinery is also much lower than reported. The data presented in the book may reflect operations prior to the modernization of the A.P.I. separators and the installation of new guard basins. We are still not satisfied with our performance in this area and are doing additional work.

Besides the oil problem, we have made significant changes in parameters of water pollution and are continuing in this effort. To begin with, when the Texas Water Quality Board issued Order 65-9, we began a major program of water improvement by installing the following wastewater installations: A sour water stripper, segregated process water and storm water sewers, modernized A.P.I. oil separators, guard basins, emulsion treating, ship ballast tanks, water-

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treating sludge lagoons, and biological oxidation unit. All of this equipment is now in service. The installation of the biological oxidation unit has reduced the BOD of our effluent substantially from that shown on page 58 of your report. I would like to draw your attention to the installation of separate sewers for process waters and stormwater. This change has reduced the number of outfalls as shown on your page 58 from 11 to 6 outfalls. Also, these changes plus inhouse improvements have made a substantial reduction in the volume of effluent.

Realizing that the Texas Water Quality Board Order 65-9 was a guideline for initial steps in water quality standards, we began a series of engineering conferences with the Texas Water Quality Board staff for the purpose of amending our permit. During these conferences it became known that the Gulf Coast Waste Disposal Authority was making its organization available to industry. Atlantic Richfield joined with other companies in supporting feasibility studies on the combined treatment of their waste. These studies have progressed to the point where the final report is scheduled to be made on July 1 of this year.

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Prior to the Gulf Coast Waste Disposal Authority studies, Atlantic Richfield embarked on engineering work to meet the water quality standards as they developed in conferences with the Texas Water Quality Board staff. These conferences with the State indicated that we would be required to meet standards far more restrictive than we had contemplated prior to this time. Because of the more rigid objectives and the insistence by the Texas Water Quality Board that an all-out effort be made to reach these new goals as quickly as possible, Atlantic Richfield employed the services of the Process Division of Williams Brothers of Tulsa, Oklahoma, to develop the scope of facilities to meet these objectives.

Even though we have been an active participant in the regional treating concept of the Gulf Coast Waste Disposal Authority, we have carried on this parallel engineering effort with Williams Brothers. The refinery will be making a decision between the regional approach and the installation of additional refinery equipment in the next few months. This decision will be made considering the economic, the

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legal and the technical aspects of each approach.

In addition, the refinery is currently spending some \$1.5 million for pretreatment facilities regardless of whether we go with Gulf Coast Waste Disposal Authority or go alone to insure the success of either option. This is over and above that already spent to reach existing Texas Water Quality Board Order No. 1115.

A footnote on page 59 of your report indicates that our effluent is normally toxic to bacteria; we do not find this to be the case. We, in fact, had dilution BOD tests run by an outside laboratory to be sure that we would not run into a bacteria toxicity problem in regard to bacteria before we installed our commercial size bio-oxidation unit. Also we did not experience effluent toxic to bacteria in our pilot plants, nor have we experienced substances toxic to bacteria in our waste streams to our commercial unit. In case this footnote refers to heavy metals that are present in concentrations toxic to bacteria, we were also concerned about heavy metals long ago and from the standpoint of their effect in our sour water stripper and bio-oxidation pilot plants. We influenced

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an outside laboratory to obtain an atomic absorption instrument for heavy metal determinations. Numerous metal analyses show historically that we do not have any metals in the amount to be toxic to bacteria and our metal levels meet the standards established by the Texas Water Quality Board.

It should be stressed that it takes time to fit the latest waste treatment technology to an existing refinery. It must be done within "real time" limitations, process design, engineering, procurement and construction.

We recognize that pollution abatement is one of the greatest challenges facing the world today. Let's meet this challenge successfully by being very factual with ourselves and establishing real facts. The greatest mistake we can make is to mislead the public in the wrong corrective action. We must, at all costs, be academically honest or the general public will become so confused that they will eventually believe no one. We are already sensing a little of this. In fact, emotionalism is displacing sound methodical judgment which has been the foundation of our country. Let's get the true effect of each legislation, rule on

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pollution control before embarking on more crash programs without learning the effect of the latest program.

(Applause.)

CHAIRMAN STEIN: You don't have a comment?

MR. VANDERHOOF: No comment.

CHAIRMAN STEIN: Thank you.

MR. KECK: For the Armco Steel Corporation, Mr. John Barker, Director of Environmental Engineering, Middletown, Ohio.

Mr. Barker?

MR. YANTIS: As you begin to speak -- I should say that we do know you edited your report in light of the litigation that you are in. And I have talked to the representative from the Attorney General of Texas. He raised no issue about you speaking. And I have had no direct communication from the County Attorney other than the report from Dr. Quebedeaux.

So, presumably, there is no bar to your speaking, certainly none on the part of the Texas Water Quality Board.

J. Barker

MR. JOHN E. BARKER
DIRECTOR, ENVIRONMENTAL ENGINEERING
ARMCO STEEL CORPORATION
HOUSTON, TEXAS

MR. BARKER: Thank you.

I am John E. Barker. Mr. Chairman, official conferees, ladies and gentlemen. My name is John E. Barker. I am the Director of Environmental Engineering for Armco Steel Corporation. As Director, I have two corporate functions. One is the function for Armco and the second is the management function for the outside engineering and design service.

Armco is in the fabrication of the steel materials in a wide range of products for industry such as construction, automotive, aerospace and defense.

Our Houston, Texas, Works is located on Industrial Road and borders the Ship Channel. It is one of eight major steelmaking facilities we have in the country, and as such it is a completely integrated operation starting with raw materials, iron ore, coal and limestone and producing a finished product of plate and structural shapes.

J. Barker

We are right now in the startup phase of a new production unit, an \$80 million production facility, producing wide-flange structural beams.

Armco's Houston Works employs over 4,500 men and women in this area with an annual payroll in excess of \$46 million. Locally, for the purchase of goods and services, we spend in excess of \$45 million and pay the State and local taxes slightly in excess of \$3.5 million.

So, as a major corporate citizen here in the Houston area, we are certainly pleased to participate in this conference and participate in the considerations of water quality as it affects the Galveston Bay area. Back in 1966, our corporation stated and published a corporate pollution control policy. One paragraph of that policy reads -- and I would like to quote -- "We recognize our responsibility to cooperate fully with private and public agencies in their efforts to protect the Nation's water and air resources.

In our plants across the country, we have been vigorously pursuing this policy, and although we

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continue to have some problems at some locations, we think the significance of this policy has been well recognized by the many awards and citations we have gotten from groups such as the Sports Foundation.

But let me limit my comments here to the Houston Works and the specific aspects of the water from our Houston Works and its impact on the Galveston Bay. I would like to make four major points.

First, Armco has taken the initiative in moving forward with significant investments in water quality control at our Houston Works.

Second, Armco has acted in good faith to cooperate fully with the Texas Water Quality Board in their enforcement efforts.

Third, because of our controls and according to the the figures we submit regularly to the Texas Water Quality Board, we seriously question the validity of some of the calculations made in the EPA Report.

Fourth, our efforts to cooperate with the Texas Water Quality Board in solving the very difficult problems of the company plant waste has been hindered by current litigation.

J. Barker

I mentioned we made considerable investments for the environmental control facilities here at the Houston Works, and, Mr. Chairman, could I have the house lights dimmed for I would like to use one visual aid at this point.

[Slide #990a.]

(Off the record discussion.)

This is a map, an overview, of our Houston, Texas, Works and the black background is our property limits. The blue at the bottom is the Ship Channel. The gray are buildings that house the various production facilities. Superimposed on this map are the various environmental control facilities that have been erected and are already in operation. These are shown in red. The units shown in orange are facilities that are in one stage or another of construction or engineering to solve remaining pollution problems.

[Overlay #990a.]

Very quickly I would like to touch on this map. Very quickly I would like to touch on the high points of this environmental control problem in our program here at Houston.

J. Barker

Item 1 is the sanitary sewage treatment plant for the Houston Works. This is a complete secondary plant with chlorination of the effluents, and the effluents from this secondary plant treating the wastes from over 4,500 people is well below the requirements of the Texas Water Quality Board.

Item 2. Throughout the plant, you will see a series of items marked "2." These items are a series of scale-pits, settling basins, and ponds for the removal of scale and oil produced in our hot, rolling operations. There are a number of those.

Item 3 is -- and I have a hard time seeing the numbers from here -- the blast furnace area. This was completely rebuilt in 1967, equipped with high-energy wet scrubbers for air pollution control, and similarly equipped with filtering facilities for removal of fines from the water.

Item 4 is our No. 2 electric furnace shop. Our new shop, with three furnaces is in operation today. And the fourth one added along the line. Each furnace is equipped with a high-energy wet scrubber for air pollution control and concurrently with it a

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wastewater treatment system to treat that water before it is discharged to the channel.

Item 5 is another small high-energy wet scrubber for dust removal. It is also equipped with a small wastewater treatment system.

Item 6 is our old No. 1 electric furnace shop built originally back in World War II. Over the years, it has added a series of gas cleaning devices, and starting in July of last year it also has been equipped with a high-energy wet scrubber. And beside it is also the wastewater treatment system.

Item 7 is an open hearth shop. It was an air polluting source and has now been shut down. And that problem is eliminated.

Item 8 is the coke plant area itself and the proposed site of the 2 deep wells, and we will touch on this particular problem a bit later.

Item 9 is the new wide-flange mill. It is now at the startup stage and is a completely new hot rolling operation equipped with a complete system of scale pits, filters and cooling towers for water cleanup and reuse. There will be no new pollution

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problems from here.

Item 10 is a sintering plant, and I will touch on that quickly because this is basically an air pollution problem. Two separate areas in the sinter plant consist of one control facility under construction and one in the pilot stage.

Item 11 is the new direct reduction facility just now starting on foundation work. This is a complete new type of steel-making facility that we have long-range hopes may reduce, or perhaps even eliminate the need for coke plants and blast furnaces.

Could we have the lights back now, please?

Thank you.

The second major point I would like to make, Mr. Chairman, is Armco is continuing to operate under the supervision of the Texas Water Quality Board, and over the years has cooperated with the Board in their very strict requirements. But I must say they are technically feasible requirements for water pollution standards.

The Houston Works operates, of course, under the permit system, and our permits are granted by

J. Barker

the Texas Water Quality Board under the 65-9 Regulation.

Since the middle of last year, of course, we are operating also under the self-reporting system. And under that system we are daily sampling our effluent flows and report flow, pH, total residue, total suspended solids, dissolved solids, BOD and COD and certain other special parameters on other outfalls. These are reported monthly to the Texas Water Quality Board.

As a third major point, Mr. Chairman, I would like to make some specific observations about the report entitled "Report on Pollution Affecting Shellfish Harvesting in Galveston Bay, Texas," which has previously been read into the record and consequently is a part of the record of this conference. I believe this report could probably be classified as what is generally known as a secondary research paper. As you know, a secondary research paper takes data from published literature or other published sources and then, using that data, makes a series of compilations, projections and conclusions from that data.

Basically, there is nothing wrong with a

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secondary research paper as long as the author follows two fundamental rules. First, he must carefully determine the validity of the data that is used, and second, he must have a comprehension and understanding of the scope and limitations of that data. And if he follows these 2 basic rules, then his research paper will present the data in the same context as the original source material.

However, in the particular report published by the EPA, we find several serious violations of these fundamental rules. And consequently it seems to us there are some extremely erroneous conclusions and some implications made in the report that are not substantiated.

I know that it is the desire of this conference -- as a matter of fact, it is the very intent of this conference -- that the record be valid and be accurate and that it be factual. And to help meet that basic objective I would like to point out a couple of specific examples of the types of errors that we have mentioned, and these are just a couple of several.

First, the basic data that is used in Table VI-2 beginning on page 58 lists the permitted maximum

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parameters, and from this data calculations have then been made and conclusions drawn which imply in the early part of the report that these are actual loads being discharged in the Ship Channel. This is obviously quite misleading in several areas. Let me give you a specific example.

In the case of Armco Steel Corporation, the author or authors have assumed a maximum permitted parameter of 25 mg/l of oil and grease from each and every outfall. This leads then to the erroneous calculation that the permitted oil and grease from Armco Steel Corporation is 6,800 pounds per day; whereas, based on the actual permit values, which vary from zero in many outfalls to a maximum of 25 mg/l in some outfalls, the permitted oil and grease from Armco Steel Corporation is not 6,800 pounds, but it is only 1,700 pounds per day or 1/4 of the amount, Mr. Chairman, as reported in your report.

Even the use of the 1,700 pounds per day is erroneous and creates a distorted picture. For the first 4 months of 1971, Armco Steel has made careful measurements of the outfalls, careful analytical data,

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and, from this series of analyses and flow measurements, the actual discharge of oil and grease has not exceeded 80 pounds per day, and in many cases considerably less. So the data as reported as 6,800 pounds in your report is contrasted with the actual discharge of 80.

In the Summary and Conclusions section on page 6, 8 industries are named, including Armco Steel Corporation, as the major permitted dischargers of oil and grease. And by the method of calculation that I just went through of using maximum values, these 8 would account for 47,300 pounds per day of oil and grease. That is 86 percent of the 55,000 pounds. I submit, Mr. Chairman, that if the actual comparison of Armco of 80 pounds vs. 6,800 pounds is any indication of the actual load vs. the reported load, then these conclusions found on page 5 and 6 must be in serious error.

I would like to point out a couple of other illustrations of how the data is not corroborated and precisely used and can lead to distorted figures, and from that erroneous conclusions can be drawn.

Let's look specifically at the figures for

J. Barker

COD, BOD and suspended solids. Again, the permitted values reported for these parameters are the total or accumulated poundage from all outfalls, including what we call Outfall 9-1, which is the use of channel water once-through for condenser cooling and returned to the channel and no contamination added.

One of the earlier speakers mentioned he thought he was the only source using channel water on a once-through basis. That is not correct. We are also using it. As a matter of fact, of all the water we pump, the channel water is by far the major part. Our permit, as reported in your report, calls for 23 MGD condenser cooling water going to Outfall 9-1. This is 71.5 percent of our total volume of discharge. Yet in the EPA report there is no credit given or no deduction, if you will, for those pounds of material that came in the channel water and immediately were returned back.

Furthermore, the actual discharges as reported to the Texas Water Quality Board under the self-reporting system are considerably below even the permitted values.

J. Barker

Let me quote three specific sets of figures.

The COD (the chemical oxygen demand) or actual permitted values are 52,038 pounds per day. Actual discharge in April of 1971 is 6,530.

BOD, the permitted value is 6,680. The actual is 2,267.

Suspended solids permitted values are 14,346. The actual is 3,433.

On page 8 of the Summary and Conclusions section again, the implication has been made that the permitted values are actually loadings to the Ship Channel. Yet as the figures I just quoted point out, the permitted values are anywhere from 3 to 8 times what the actual discharges or contributions are.

One other point. The heavy metals data presented in Table VI-4 on page 74 should have been qualified. A major part of that data has been based on limited grab samples. Those of us who have been in the business a long time realize how dangerous and misleading a very limited number of grab samples can be.

For example, Table VI-4 reports that the

J. Barker

Armco Steel Corporation discharges out of Outfall 56, 146 pounds per day of zinc. And yet as determined by actual flow measurements and by analysis during the first four months of 1971, we discharged 2.2 pounds per day of zinc from that outfall. So, the Federal data here represented in the EPA report is 66 times the actual discharge.

Based on these observations, Mr. Chairman, I would like to suggest to the conferees that in your deliberations and in the Executive Session very serious study be made of the report unless false conclusions be drawn.

My fourth and final point -- and I will try to be brief; I know everybody is tired -- I would like to discuss briefly the coke plant problem that has received so much publicity in the Houston area and has been referred to so many times in the EPA report. As Mr. Yantis has mentioned, it is the subject of current litigation. That litigation continues, and because of the litigation the problem continues.

I will try to touch on it carefully so I don't get myself into hot water. But I think you, the

J. Barker

conferees, are entitled to see the types of studies that have been made. The facility, of course, is a basic coke plant. And again if I could, I would like to have the house lights dimmed because I would like to refer to some visuals that I think will help you take a look at what the problem really is.

[Slide #990b.]

The coke plant, of course, is nothing more or less than an oven in which coal is baked to produce a material that we call coke, or basically a dense carbon for the purpose of steelmaking. This particular coke plant was built back at the beginning of World War II by an Agency of the Federal Government -- the Defense Plant Corporation -- operated by the Federal Government during war years.

I presume because of wartime pressures this plant was not equipped with what we would call an adequate by-product plant in today's terminology. So, consequently, the material that is draining out of the coal, the volatile material, some of this is going into the Ship Channel due to the fact that the by-products plant is not adequate and not complete. It is washed

J. Barker

out in what we call the final cooler and discharged to the channel.

One other thing I think you need to notice on this particular flow diagram is the pipes in yellow. The coke gases produced are a valuable source of fuel. They are reused in the ovens to make the coke, and also some of it goes off to steelmaking - a conservation of raw material.

Over 3 years ago, we appointed a corporate task force to look at this particular problem. The task force was charged with the responsibility of coming up with the best environmental answer for the water pollution problem of the Ship Channel. That task force examined over 12 different alternatives. I would like to quickly touch on 5 of them that we were given a detailed engineering study on, because they looked like they had some promise. Could we have the next slide, please?

[Slide #990c.]

One of the systems that we studied is called "biological treatment." In this particular system, the wastewaters would be carried to

J. Barker

a 3-stage biological system. All of the organic materials would be oxidized to CO_2 and water. Ammonia oxidized first to nitrates and reduced back to nitrogen gas. This is not a commercially available system today. This is a unique and different type of development carried out by the American steel industry primarily. It looks so attractive that the Federal Government funded this pilot plant research for over 18 months at the Houston Works. That works has just been finished. The draft of that report is now in Federal hands. It does not completely solve the problem and the technology has not, to date at least, been demonstrated to be what we think is a practical answer at this point in time.

Could we have the next slide, please?

[Slide #990d.]

Plan B would eliminate a water pollution problem completely by shutting down the by-products plant, taking all of the dirty gas off the top of the ovens, and burning it in a flare stack.

If you don't have the by-products plant, you don't have the water scrubbers. If you don't have

J. Barker

the water scrubbers, you obviously don't have the pollution problem. There are two things in this scheme that must be considered in burning the raw coke oven gas. You do have a potential addition to the air pollution problem in terms of sulphur dioxide and oxides of nitrogen.

One other point that must be looked at is by wasting this coke oven gas, you must make up that fuel from some source. And in this particular case that would mean buying more natural gas from the outside. And this would be the equivalent of wasting 8,000,000 cubic feet per day of natural gas.

Let's see the next slide, please.

[Slide #990e.]

Plan C is a modification of the by-products plant, completely adding additional processing facilities to remove ammonia, and taking that ammonia to an incinerator and burning it, and carrying some of the waste liquors to a smaller biological treatment plant. The environmental impact of this system is you do not completely eliminate the water pollution problem. You still have a residual load of things

J. Barker

like cyanide and thiocyanate and ammonia being discharged to the channel. You also have the additional possibility of burning ammonia and adding to the oxides of nitrogen problem.

Plan D, if you would, please.

[Slide #990f.]

Plan D was proposed rather vigorously, I might say, by people from the EPA and is commonly known as alkaline chlorination. And, quite frankly, the metal-plating industry is using it regularly where you are talking about small volumes of high concentrations of cyanide. Here in the coke plants we are talking about large volumes of water and small concentrations of cyanide, and not simple cyanide as you have in plating waste but a complex organic cyanide. The system you see on the drawing, which is an artist's sketch really of what such a system might look like, has not been put into practice to my knowledge anywhere in the world.

We have investigated in the laboratory, and we found in the laboratory study it is not nearly as simple or as easy as was suggested by the EPA people,

J. Barker

and we have since abandoned this particular line of approach.

The next slide please.

[Slide #990g.]

Another scheme that has been looked at very carefully by the task force is deep well disposal.

In this particular scheme the contaminated wastewater from the coke plant area would be collected and treated in a plant aboveground by filtration and then injected into deep wells over 7,000 feet deep. This is a practical scheme and, in our judgment, a completely safe scheme. It is not new and novel. It is being used many places in the country. As a matter of fact, there are many deep disposal wells here in the Houston area. In this particular operation we were concerned about a careful look at the geology. We hired two independent geologists to make independent studies of the feasibility of this. They suggested to us that it is completely practical and a safe scheme and certainly it has been demonstrated by other people.

We did propose this particular scheme to the Texas Water Quality Board in the fall of last year.

J. Barker

It was looked at very carefully and reviewed very carefully and subsequently permitted. I think we might take a quick glance at just the geology for those who don't have the feel for it here in the area.

[Slide.] (Previously numbered.)

This is a cross section through the Houston area. The blue you see at the top is the freshwater formation. The very bottom of the freshwater formation, as you can see, is about 2,600 feet below ground. This deep well disposal system proposes to go down 7,000 feet.

[Slide.] (Previously numbered.)

I think the next map might show it a little better.

[Slide.] (Previously numbered.)

In the proposed system the waste would be injected in the so-called frio sand, which is the wide yellow band at the bottom. You see the very deepest of the freshwater formations there at 2,600 feet, and between the frio sand at 7,000 feet and the freshwater are very, very thick layers of highly condensed and compact marine shales. Those are the areas shown in black.

J. Barker

So, this, of course, is the protection that you must have in a deep well disposal system to show the waste stays in the formation you put it in. Probably this particular section in the Houston area is the best geologically in the country for this type of disposal.

Could we have the lights now, please.

In summary, Mr. Chairman, of all the alternatives the task force looked at, it is our sincere and firm belief the deep well disposal system is the best environmental answer for this particular problem, for the very reason it completely eliminates the water pollution problem and does not contribute to the air pollution problem. Nonetheless, we are continuing to investigate other alternatives, such as the Gulf Coast Waste Disposal Authority, as was mentioned by General Hatch yesterday.

I think we at Armco can attest to the fact that the Texas Water Quality Board has very vigorously pursued the public interest, because about 2 months ago they ordered Armco to proceed to drill this very expensive deep well by a given date to live up to the terms of our permits. And they did this in spite of

J. Barker

the types of threats that have been made by some people at EPA, and the threats were an injunction would be brought forth, and it subsequently was.

As one newspaper in the Houston area quoted the following day after the injunction, "Armco was between a rock and a hard spot." And we have been.

Thank you.

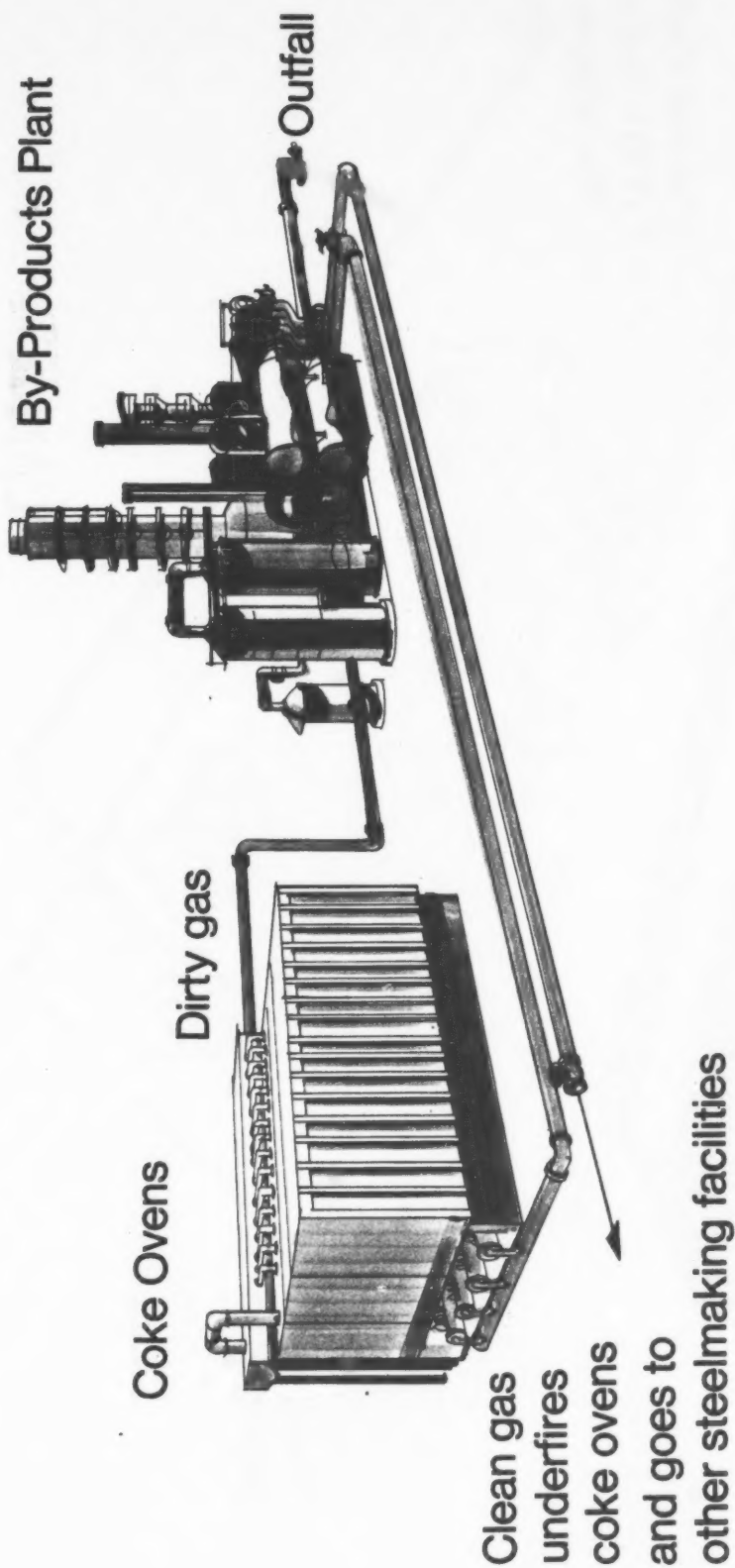
CHAIRMAN STEIN: Thank you very much.

(Applause.)

Again, Mr. Barker, I think I am going to have to ask that you get together with our staff on your attachments. At least the last three, won't reproduce.

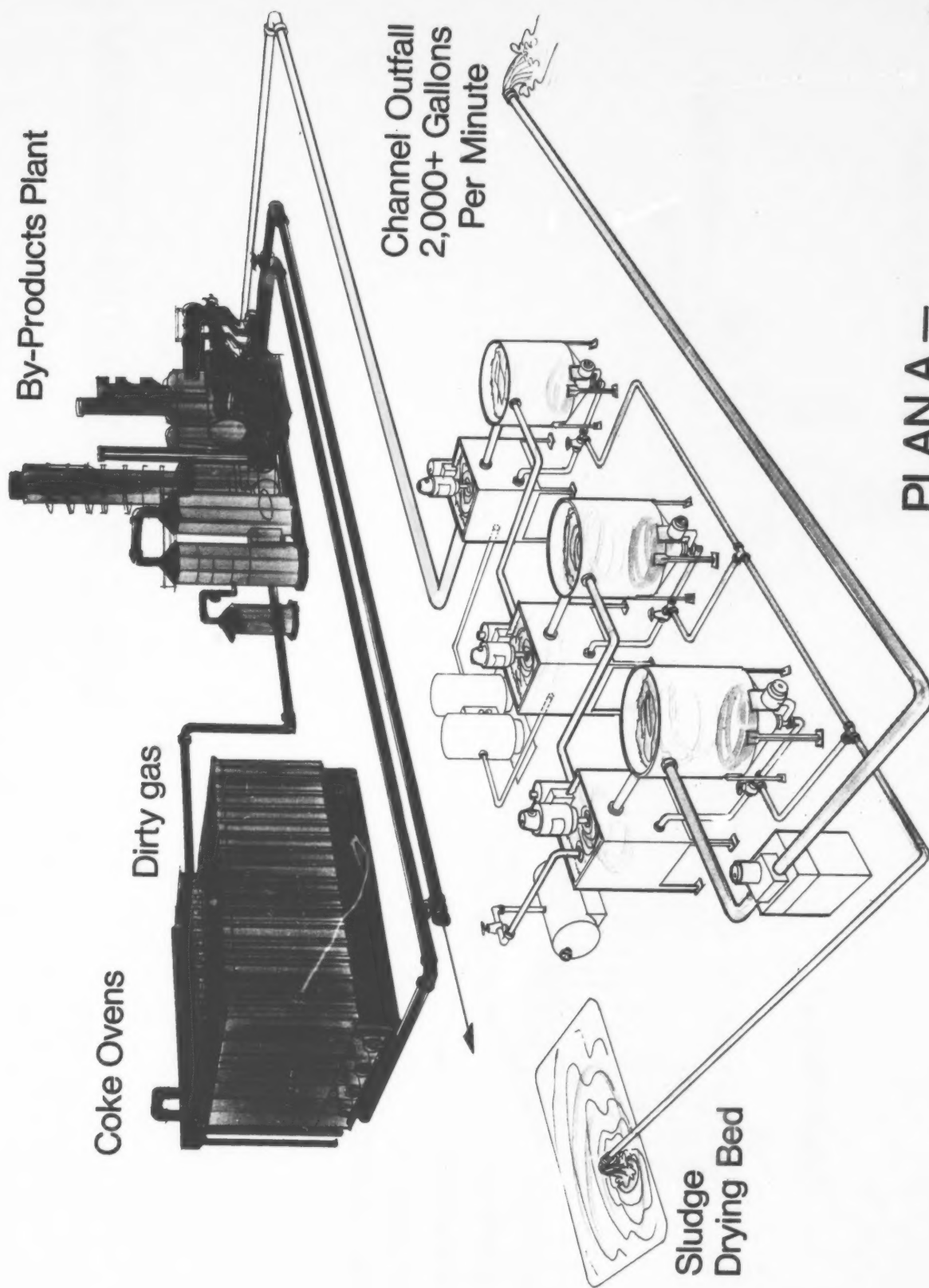
MR. BARKER: We would be pleased to, sir.

[The above-mentioned attachments follow.]



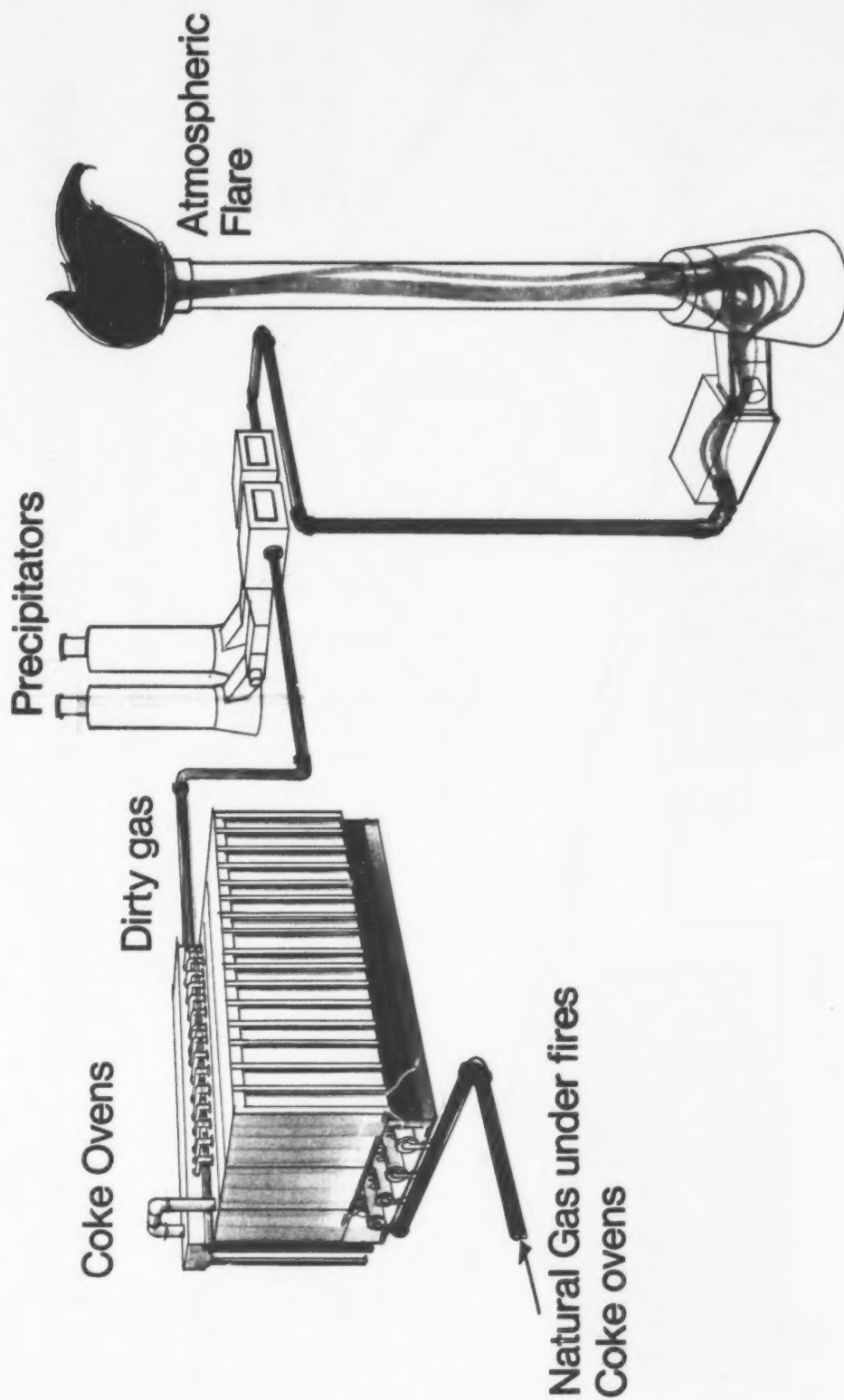
COKE PLANT FLOW DIAGRAM

990b

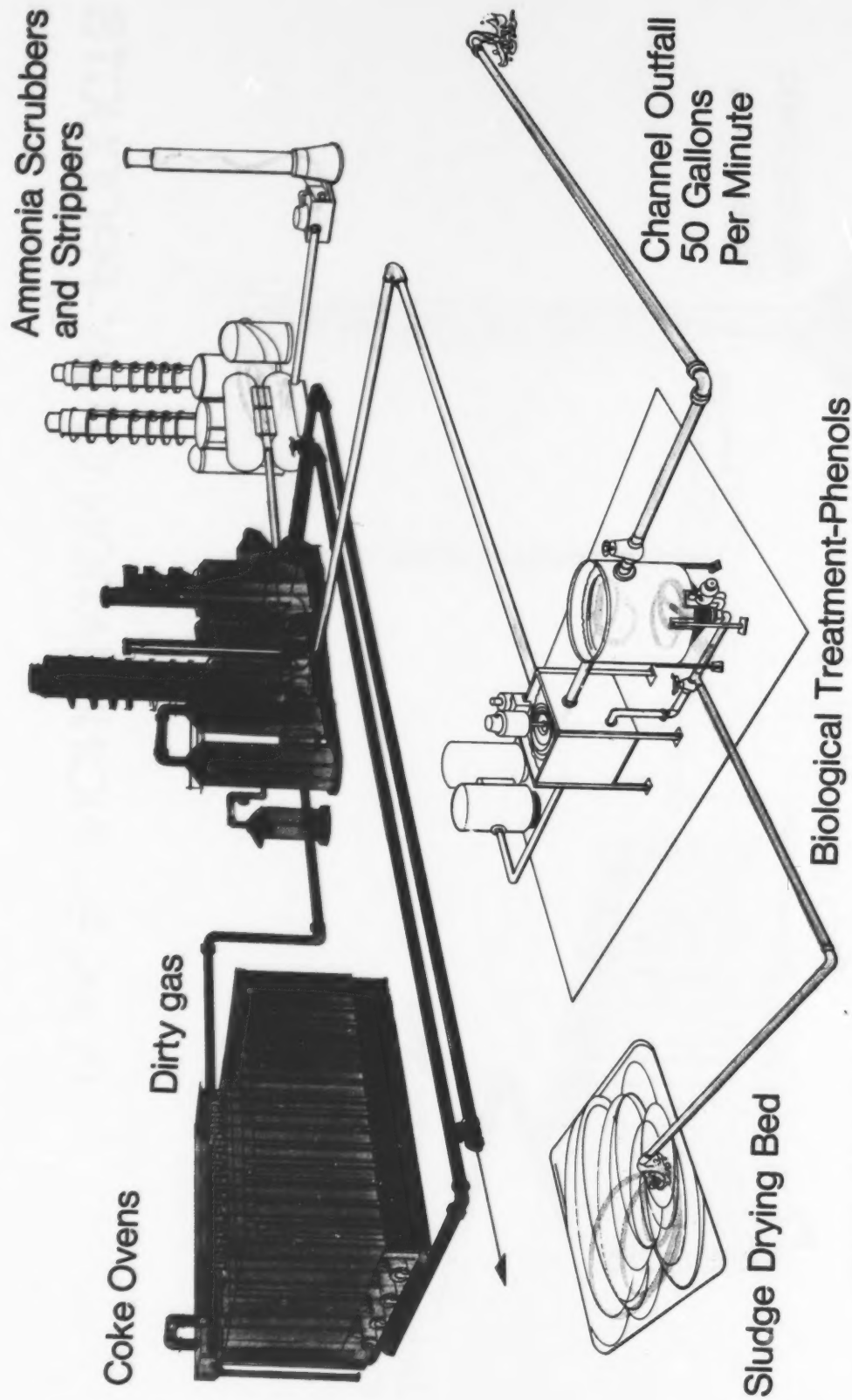


990c

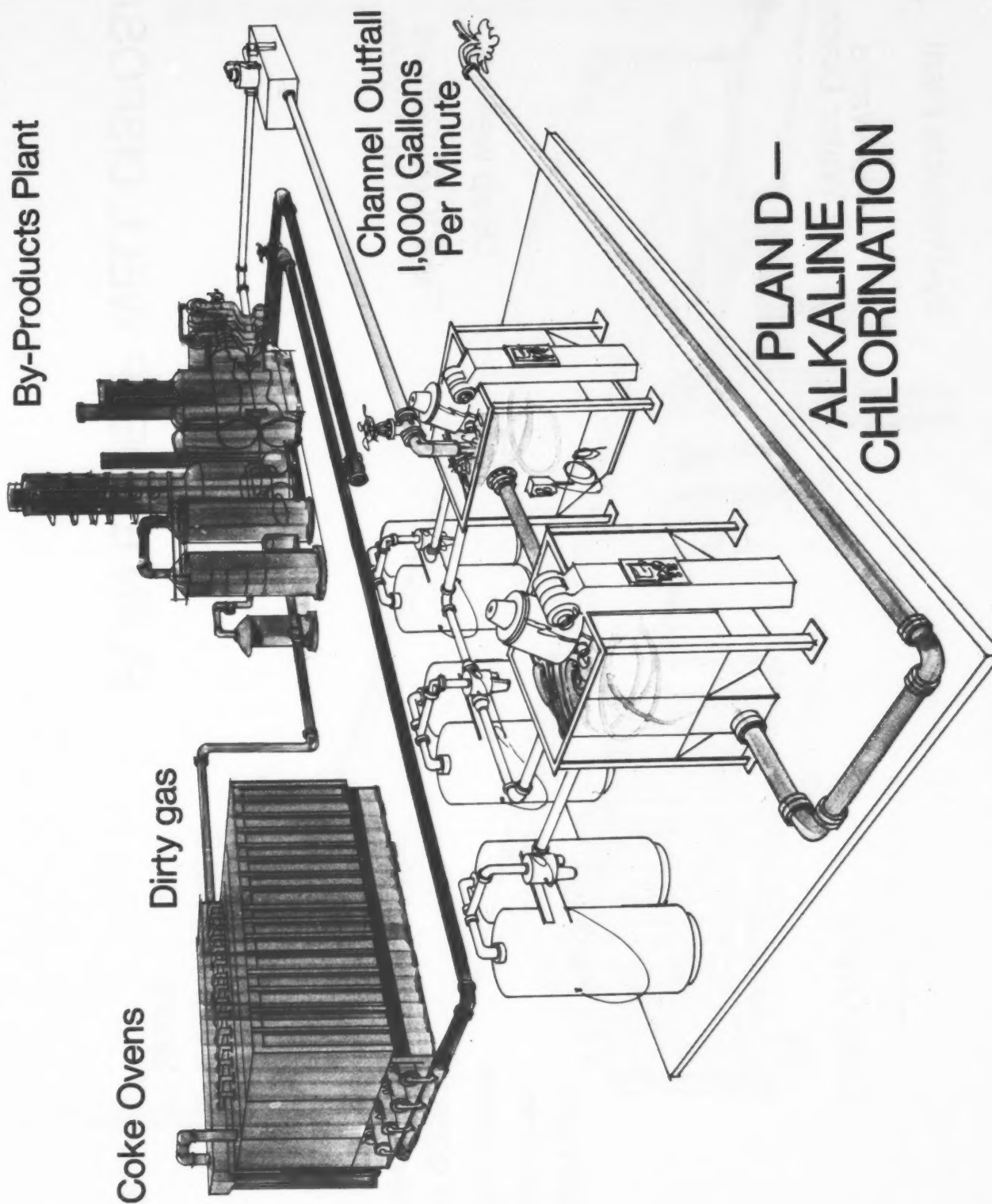
PLAN A - BIOLOGICAL TREATMENT PLANT

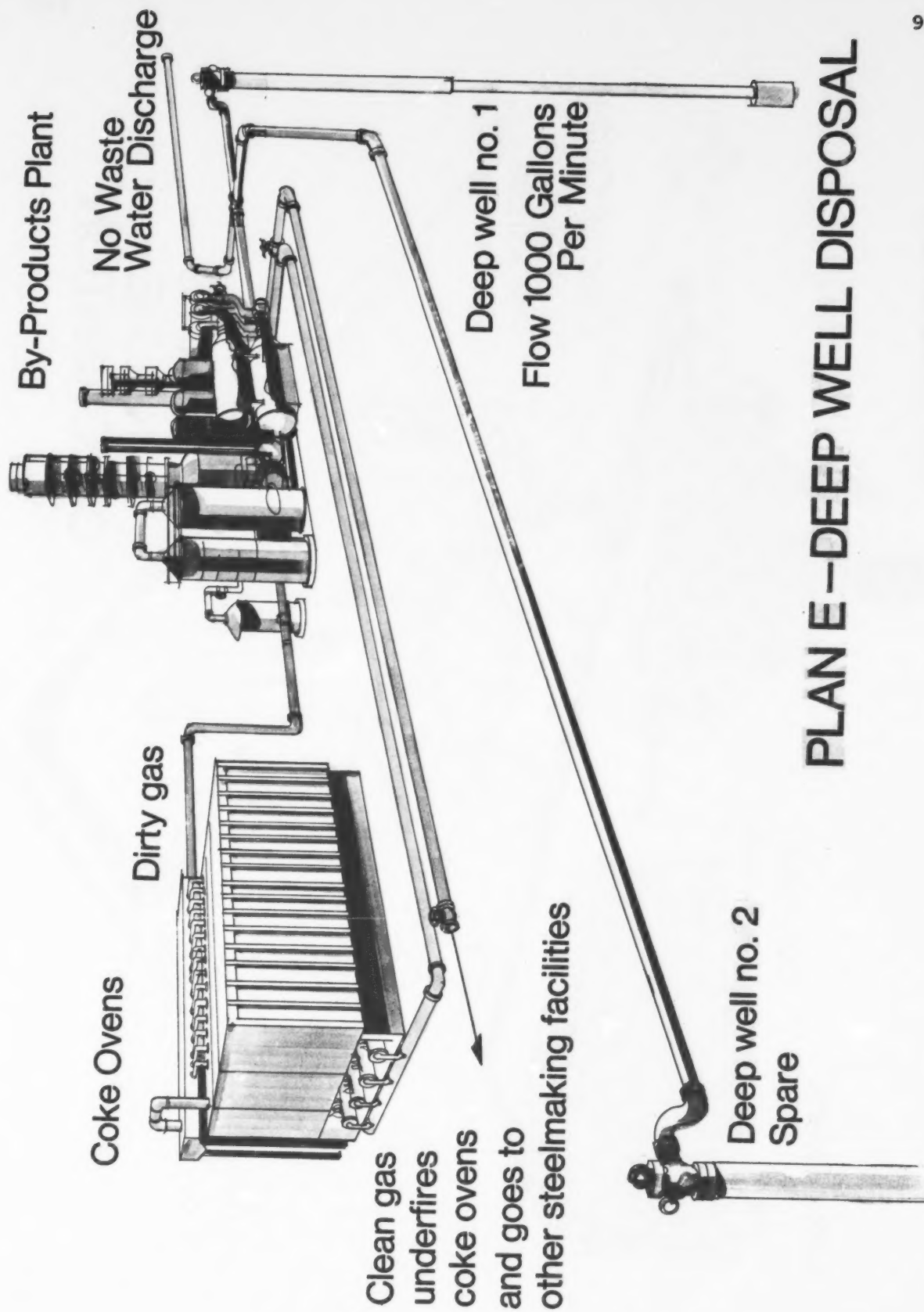


PLAN B—INCINERATION OF BY-PRODUCTS



PLAN C — MODIFICATION OF BY-PRODUCTS PLANT



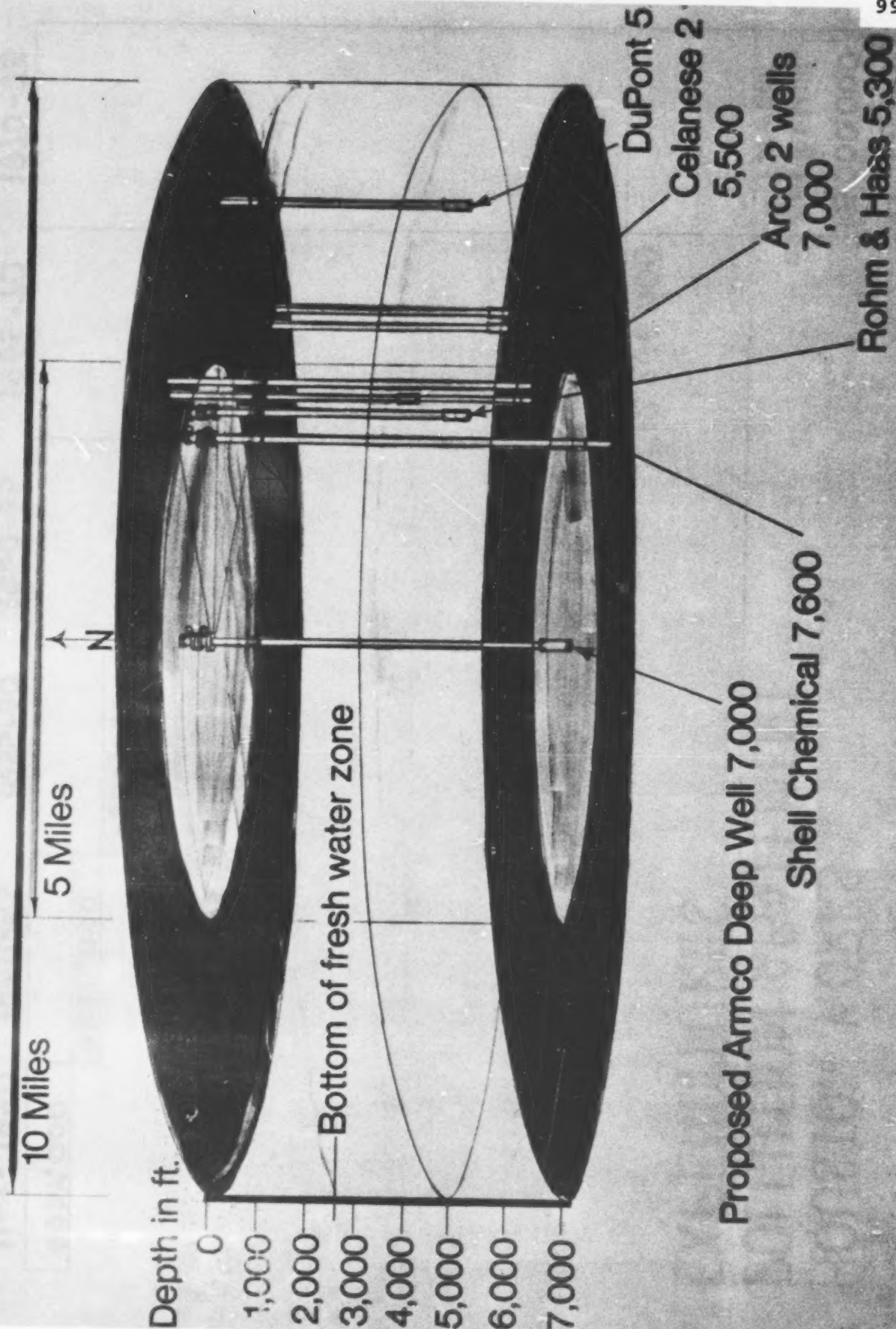


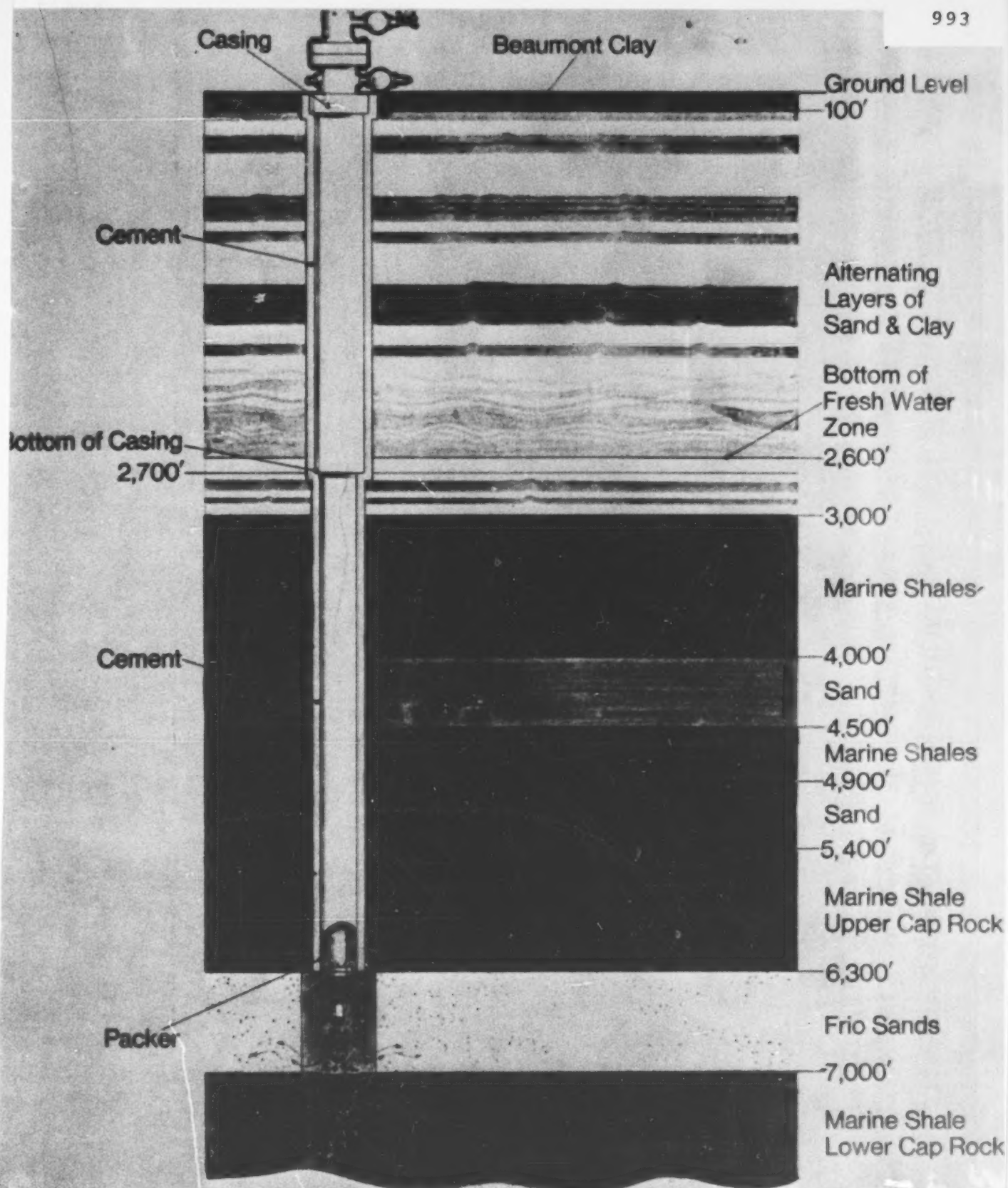
PLAN E--DEEP WELL DISPOSAL

HOUSTON WORKS POLLUTION ABATEMENT EXPENDITURES

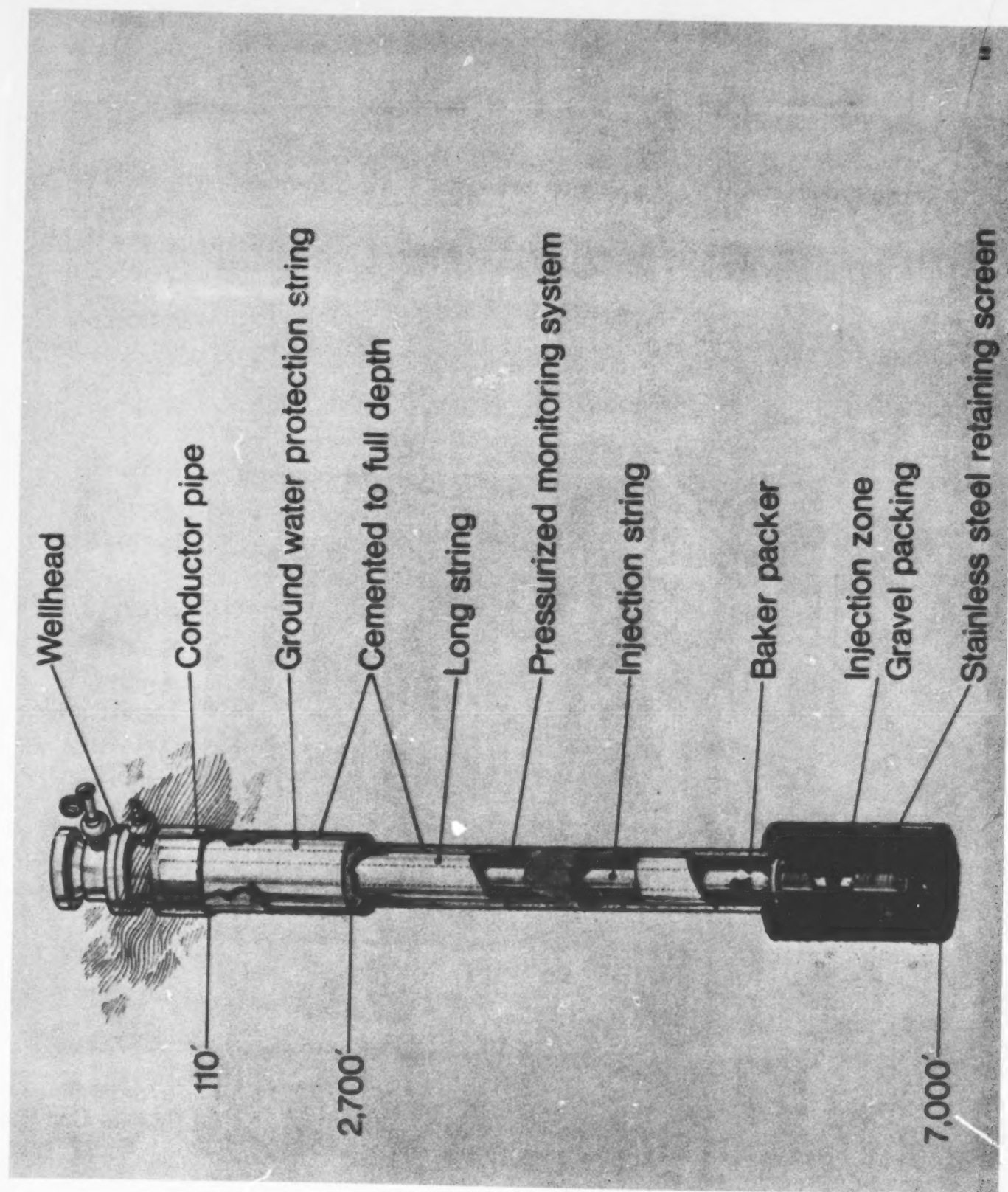
\$17,266,000					
\$5,000,000					
Est \$1 Million Per Year					
	\$12,266,000				
	\$8,718,000				
		\$1,369,000			
			\$682,000		
			\$560,000		
			\$937,000		
				Up to 1950	1950-55
				1955-60	1960-65
				1965-70	1970-75

HOUSTON AREA DEEP WELLS





PLAN E — DEEP WELL DISPOSAL



J. Barker

MR. YANTIS: Mr. Stein, because of the litigation, at least so far as Texas is concerned, I would ask no questions. I would also state that the conferees will make whatever judgment they wish at a later time on the matters that you have presented. I would not, however, want there to be any implication either for or against that we agree or disagree with what you said. I think that our allowing you to speak is quite proper, but to discuss it or evaluate it I think would be improper.

CHAIRMAN STEIN: I think this is true for the Federal people too. Though I must say in looking at your last chart of the frio sand, it occurs to me that the stratum you are going into are "between a rock and a hard spot."

MR. BARKER: We hope it is between two hard rocks, sir. It is supposed to be.

CHAIRMAN STEIN: All right.

For the same reason, we are refraining from comments. But we do certainly appreciate your full explanation on this and you have to understand that we are inhibited on this because of the litigation.

J. Barker

Thank you very much, sir.

MR. BARKER: We thank you for the opportunity.

Thank you.

CHAIRMAN STEIN: Right.

MR. YANTIS: Would you announce again the meeting place and the meeting time for tomorrow?

CHAIRMAN STEIN: We will meet tomorrow on the 18th floor of this hotel at a place called the Terrace, and we will again start at 9:30 tomorrow. Just for the sake of those people who may not be here tomorrow, if we go on to Friday, we will be back here. But, we will meet up there tomorrow.

MR. KECK: Mr. Chairman, I believe it is about 2 minutes until 5. I have one other man from out of town who says he can give a 6-minute speech in 2 minutes.

(Laughter.)

MR. YANTIS: Does he have a written copy of it?

MR. KECK: Do you have a written copy of it, Charlie? This is from the Olin Corporation. Come

C. C. Hightower

on up, Charlie.

MR. YANTIS: At the close of his presentation, there will be a combination announcement-invitation. So I would like for you to not run off too quickly.

MR. C. C. HIGHTOWER
MANAGER, ENVIRONMENTAL CONTROL
SOUTHWEST REGION, CHEMICAL GROUP
OLIN CORPORATION
HOUSTON, TEXAS

MR. HIGHTOWER: Mr. Stein, other conferees, ladies and gentlemen.

CHAIRMAN STEIN: I'm sorry. Why don't you let us have your name first.

MR. HIGHTOWER: Oh, I'm sorry.

I am C. C. Hightower.

CHAIRMAN STEIN: Thank you.

MR. HIGHTOWER: I am Manager of Environmental Control for the Chemical Group of the Southwest Region, Olin Corporation.

Olin Corporation has been located on the

C. C. Hightower

Houston Ship Channel since the late forties. Over the years, it has engaged in the manufacture of inorganic fertilizer materials and never in the production of organic chemicals nor in the processing of heavy metals.

Contrary to what appears in the conference report, Olin is not a quote, "Major discharger of heavy metals," unquote.

We are at a loss to understand some of the 1969 data concerning the Olin Pasadena Plant reported to the conference with respect to the discharge of heavy metals data reported in Table VI-4, especially the zinc losses which are alleged to be in the order of 930 pounds per day. The reported values appear to be in error.

We request the record show that a recent EPA field survey of the Pasadena plant effluents indicated that the heavy metals discharge in no way approach the magnitude of the metal concentrations as presented in the conference report. As a matter of record it should be reported that the heavy metals analyses made by Olin in the second half of 1970

J. Teller

closely approximate the recent EPA findings.

We appreciate the opportunity to make this statement.

Thank you.

(Applause.)

CHAIRMAN STEIN: Thank you.

MR. YANTIS: On behalf of the Chairman of the Texas Water Quality Board and myself, Deputy Director Joe Teller will speak to you for just a moment.

MR. JOSEPH TELLER

DEPUTY DIRECTOR

TEXAS WATER QUALITY BOARD

AUSTIN, TEXAS

MR. TELLER: The Chairman has requested me to make these comments. There seems to have been in the past 3 days some indication of a lack of communication between the State agencies and the Federal Agencies.

As a possible way of starting some lines of communication, the Chairman thinks that a non-

J. Teller

business-type social would be appropriate. And through the auspices of State Senator Schwartz, Mr. Clark, a representative of Senator Schwartz, has announced that at least one if not all of the local seafood folks who distribute seafood products are sort of hurting. As a matter of fact, one man, who normally sells between 500 and 1,000 pounds of shrimp a day, as of about 2 o'clock today had sold only 3 pounds. Now, he is the fellow who is kind of getting hurt by the publicity attendant to this exercise here.

The man has said, "Gee, fellows, I'm going to have to throw that stuff away anyhow. I am going out and catching it everyday hoping somebody will buy it."

And so, through the combination of Senator Schwartz' representative and this very generous offer, we have arranged for a shrimp and crab boil for representatives of the State agencies, and the EPA. And the chairman has extended, of course, this invitation to the representatives of the press.

Now, I wish it could be extended to everybody, but this man hasn't got this kind of

J. Teller

facilities. So we will have to sort of hold it down to that. But to help the gentleman plan for the feeding, which is to take place tomorrow evening following the adjournment, I would like to have some indication from the State folks and the press and EPA as to how many will be there.

Could I have a show of hands?

(Show of hands.)

MR. YANTIS: I have got 26 and I think that's close enough.

VOICE: If you need any more shrimp or crab, I will donate it to your cause. (Applause.)

MR. TELLER: Thank you, sir.

MR. YANTIS: Mr. Chairman, do you wish to make any comments as we adjourn for the day or before I turn it back over to you?

CHAIRMAN STEIN: Yes. I do want to say something here that I don't think is well understood. This deals with the jurisdiction of the conference.

I know the Federal report went into a discussion of all commercial fishing, but the word "shellfish," as used in the restrictions we have in the

J. Teller

State and Federal programs, does not extend to shrimp and crab. Shellfish relates to bivalves such as clams, oysters, mussels, or fish which are rather widely eaten raw. This means they go down the alimentary canal into the digestive tract, where the possibly-polluted fish may then have a harmful effect. All of these are fish that we have to be very careful about, and I want it to be understood.

When we talk, or the Federal Government talks about moving in or having jurisdiction in a case because shellfish are affected -- shellfish which cannot be shipped in interstate commerce -- it applies just to the fish I was talking about.

VOICE: Mr. Chairman, my only interest is I am a producer of oysters by the sack.

MR. FULCHER: Mr. Chairman, this thing has hurt these people down here desperately and badly. Since the Federal Food and Drug Administration and the State Health Department -- the people who are responsible and are charged with seeing that safe marine life is available to the public to purchase and to eat -- and since the charts as presented yesterday by the State Health Department -- and I believe from Federal sources --

J. Teller

show that the Texas Gulf Coast oysters are far better than those on the eastern and western beds, I think that if you felt inclined, it would certainly be appropriate to help these people. Because, obviously, it has hurt the shrimp and crab people, as you said. And I think, since they had and still have, given the oyster people a clean bill of health that we ought to do it, or it would be appropriate to do what you could to remove the stigma from their business too.

CHAIRMAN STEIN: Right. Mr. Fulcher, as I indicted to you when you finished your presentation yesterday, there are two problems here -- two questions we had.

One was where we had closed shellfish beds. I think the State, Food and Drug Administration, and everyone else agrees these are closed. This may be a reason why we have closed beds, and I am not prejudging your case. There are other things and there were pieces in the report about open shellfish beds.

Now, if this will do any good and I can just state the fact -- I don't want to prejudge anything. But since I have been here, I have been eating oysters

J. Teller

every day for lunch across the street, and last night for dinner I had shrimp and crabs -- to show you what I think of them.

(Laughter and Applause.)

MR. TELLER: Thank you very much, Mr. Stein. On behalf of the State of Texas, on behalf of the shellfish fishermen, shrimp, crabs, oysters, etc., down here, we do thank you. I don't know of any better way to clear it up than the fact that you are eating them yourself. And supposedly, oysters are taken from and sold from only approved areas. I do think that, as I said a moment ago, there couldn't be any better endorsement of their safety than the fact that the Chairman of this conference has been eating them for the past 2 days.

Thank you very much.

CHAIRMAN STEIN: You are welcome.

MR. YANTIS: There was one man who stood up in the back of the room as though he wanted to ask a question.

VOICE: It wasn't a question, but I will go ahead and throw the oysters in along with the shrimp

J. Teller

and crab.

MR. FULCHER: That is the man putting it on.

CHAIRMAN STEIN: Thank you.

(Whereupon, the conference adjourned
until 9:30 a.m., June 10, 1971.)

Thursday, June 10, 1971

A.M. SESSION

CHAIRMAN STEIN: Let's reconvene. How are the acoustics back there? Can you hear all right?

VOICE: Right.

CHAIRMAN STEIN: Thank you very much.

Before we begin, I would like to repeat a request that I made before. Please give the reporter a copy of your statement if at all possible before you begin talking.

It is an arduous task indeed to take testimony in a technical conference of this type, and I think in the name of humanity I will ask you again, please submit available copy because I know how hard that job is, and let's all try to make it as easy as possible.

Mr. Yantis:

MR. YANTIS: Mr. Keck, Dave Keck, are you available?

MR. KECK: Yes, sir.

MR. YANTIS: Dave, as you start out, Dr. Kirk Strawn from Texas A & M has a statement to be read in connection with the Houston Lighting & Power Company

studies he has done, but work it into your schedule as you think best.

Just keep in mind that he has a statement to make. You can start with him or you can have someone else, whichever you prefer.

MR. KECK: How long does he want to talk?

MR. YANTIS: Not more than 15 minutes, maybe less.

MR. KECK: Why don't we start with him?

MR. YANTIS: All right.

Dr. Strawn, we will start with you.

DR. STRAWN. I don't have the copies to hand out yet.

MR. YANTIS: How long will it take?

DR. STRAWN: An hour or 2.

MR. YANTIS: We will have to put you on sometime near lunch.

CHAIRMAN STEIN: Go ahead.

MR. KECK: Good morning.

We will continue the presentations from the Houston Ship Channel-Galveston Bay area industries.

Our first speaker this morning represents Southland Paper Mills, Inc., the newer of the two paper mills in Houston.

R. O. Gribble

They will be represented by Mr. R. O. Gribble, Resident Manager of the plant.

Mr. Gribble?

MR. RISDON O. GRIBBLE
VICE-PRESIDENT, HOUSTON MILL MANAGER
SOUTHLAND PAPER MILLS, INC.
HOUSTON, TEXAS

MR. GRIBBLE: Mr. Chairman, conferees, ladies and gentlemen: My name is Risdon O. Gribble. I am Vice-President and Resident Manager of the Southland Paper Mills, Inc., plant in the Houston area.

Our plant is located about 12 to 13 miles from the Houston Ship Channel. Our effluent is piped from the plant location to the Houston Ship Channel. The plant is located immediately west and adjacent to the San Jacinto River and immediately north of U. S. 90.

Although our plant is located on the fringe of the industrial area, I live in the center of it -- almost in the center, anyway. I live in Baytown. I am intimately associated, at least indirectly, with the entire Houston industrial area, the Ship Channel and

R. O. Gribble

Galveston Bay.

The protection of the environment is obviously a matter of major concern and rightfully so.

Water is among our most valuable resources, and all of us -- by our very living and breathing -- enjoy the use of it and contribute to the reduction of its quality.

Southland Paper is constantly aware of its responsibility for water conservation, and I can assure you that it is the purpose of our company to be a public asset in the Houston area, not a liability.

It has long been the policy of our company to operate its facilities, especially those concerned with the use of water and the treatment and release of wastewater, in the public interest.

Since our company has a unique history and has had certain environmental experiences that arose from unique situations, we feel that we have gained valuable knowledge that has put us in a position to serve the public interest more effectively.

Southland's history goes back to the late 1930's when Texas and Southern newspaper publishers,

R. O. Gribble

along with other business leaders, advanced the idea of a paper mill to manufacture newsprint from southern pine trees as a means of insuring newspapers in the Southwest of a dependable and economical supply of newsprint. Until then, newsprint used in Texas and the South was imported from outside sources.

In 1940, Southland completed a pioneer newsprint mill at Lufkin and began supplying newspapers with the first newsprint made from southern pine. Understandably, we are proud of this heritage as the South's pioneer newsprint industry.

This achievement became the catalyst for widespread expansion of the southern paper industry. It also created a new market for a plentiful supply of pine timber, produced new payrolls, and gave newspapers a readily available source of newsprint.

While these benefits are certainly valuable, both to our customers and to the areas in which we operate, it is the feeling of Southland's management that they do not by any means constitute a reason to disregard the environment.

This feeling became interwoven with our

R. O. Gribble

company policy early in its history, and it continued to be a guiding factor in company planning.

I might add, incidentally, we have under study at this time an engineering economic survey leading we hope to the installation of an additional newsprint machine in the Houston mill. If this should eventuate, it will give the Houston mill an annual newsprint capacity of approximately 338,000 tons of newsprint. Our present capacity for newsprint is about 138,000 tons. In addition to this, we manufacture about 100,000 tons of lightweight natural kraft paper.

When it completed its pioneer Lufkin mill, Southland found itself in a unique situation. The mill was located on a small inland stream with an intermittent flow and it became apparent that unusual efforts would be required to treat the mill's effluent.

Thus, in a time when there were no water quality laws and when the environment was of little concern, Southland voluntarily began its own environmental program. Little previous work had been done in the field and much of the early effort had to be done by the company's own staff without the benefit

R. O. Gribble

of outside help.

Extensive water reuse equipment was installed within the mill to reduce the amount of total effluent. Fiber-recovery facilities were constructed and the first activated sludge treatment plant ever used by a paper mill in the United States was installed.

I mention this history to emphasize that Southland, while pioneering in the manufacture of a vital new product, also pioneered in the treatment of paper mill effluent.

In the 1960's, when Southland decided to build a new newsprint-kraft mill in northeast Harris County, the company was able to use this Lufkin-acquired technical knowledge and experience to design a paper mill with unusual environmental controls.

The new mill was engineered to include process equipment with sufficient capacity to insure a high recovery efficiency of pulping chemicals. Extensive water reuse equipment was also installed, resulting in a considerable reduction in the amount of water used per ton of paper produced.

During the design of the Houston mill, it was also decided to spend in excess of \$5 million on

R. O Gribble

additional equipment to protect the environment. Of this sum, more than \$2.5 million went into the construction of an activated sludge treatment plant, one of the largest of its size in the South.

Tremendous added protection was built into the treatment plant by using two clarifiers both for primary and secondary treating. All piping to the clarifiers was designed to carry the full flow of the mill's effluent to only one clarifier in the event of operating difficulties or maintenance on the other unit. Some of the precautions taken in the design and construction of the treatment plant were considered excessive by consultants, but it has proven invaluable in preserving the continuity of good operations during maintenance periods.

H. A. Simons, Limited, of Vancouver, B. C., Canada, which designed the mill, reported in 1967 that Southland "is one of the few mills in the world that has taken extraordinary measures" to control pollution. I might add, although Simons was the principal consultant on this mill, the waste treatment was designed by a local firm, Brown and Root. Thus, the

R. O. Gribble

comment made by H. A. Simons is not with regard to their own design work, but with regard to the design work of another firm.

Following the startup of the Houston mill, Southland has continued its efforts in the environmental field by conducting continuous research aimed at improving of our existing facilities, constant review of the effectiveness of these facilities, and expenditures in other environmental areas.

Earlier this year, the Company completed a \$1.2 million sludge disposal system that will remove the sludge produced by the effluent treatment plant, and burn this sludge with pulpwood bark in a power boiler. This system, which we believe to be the first of its kind in the paper industry, offers a unique opportunity to eliminate a waste that has been an environmental problem for many years.

At the Houston mill, which began production in 1967, Southland has spent almost \$7 million on physical environmental improvement projects. This figure -- which we believe is outstanding for a single 2-machine paper mill -- represents an environmental

R. O. Gribble

investment of \$14,000 for each of the 500 men and women who work at the Houston mill. While these expenditures have been valuable and certainly indicate that we are seeking and obtaining results, they are not offered and will not be used as reasons to lessen our efforts to improve the environment. Our environmental investment at Houston, coupled with a carefully designed mill and many years of past experience in the field, has enabled Southland to operate its Houston mill to the best of its ability in the public interest. Southland is aware that every increase in treatment cost adds to the cost per ton of newsprint for our publisher customers. But, again, we do not intend to let this be an obstacle to adequate effluent treatment.

I believe that it is important to emphasize that the Environmental Protection Agency report on Galveston Bay lists the "permitted" discharge in Flow, BOD, COD and Suspended Solids. Southland's actual discharges, expressed as percentages of the figures reported by the EPA, are as follows: Flow - 24 percent; BOD - 8-1/2 percent;

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COD - 22 percent; Suspended Solids - 7-1/2 percent.

These percentage figures are based on the self-reporting data furnished by the company to the Texas Water Quality Board for the 11-month period during which self-reporting has been in effect.

I would also like to state at this time with respect to oil and heavy metals, which have been mentioned on numerous occasions at this conference, that we have been unable to confirm, either in our own laboratories or in independent testing laboratories, those discharges reported by the EPA. I think this is to be expected since the EPA report states the figures are based upon grab samples and that further verification of these figures is required.

In the treatment of this effluent and of any additional effluent created by mill expansions, which may arise from increased newsprint demands in our market area which includes the important Houston area, Southland certainly intends to incorporate new and improved treatment techniques as fast as research and experience make them feasible.

While Southland has made good progress in

R. O. Gribble

treating its effluent in regard to solids and oxygen, the presence of color -- caused by the contact of wood and water and/or chemicals -- is in need of more research, more feasibility studies, and more practical data.

We understand that the Environmental Protection Agency realizes this problem and is co-sponsoring major grant programs with cooperating industry intallations at 4 or 5 locations in an effort to find some practical solution.

Southland has followed these programs with interest. At the same time, some of the early work on lime treatment for color removal was performed at Southland's installations, and we are continuing our work with the National Council of the Pulp and Paper Industry for Air and Stream Improvement in arriving at processes that are being evaluated with EPA grants and industry money.

In summary, I would like to emphasize that Southland voluntarily established itself as a pioneer in the treatment of effluent. It has been our continuing purpose to protect the public interest with advanced environmental facilities.

R. O. Gribble

Our company has committed itself to this course, and I assure you that the commitment will be continued.

Thank you. (Applause.)

CHAIRMAN STEIN: Any questions?

(No response.)

I just have one -- I certainly appreciate the spirit and attitude of your paper and your presentation -- and, this is a question on color. We -- at least I -- have been informed by plants in other areas we have worked with on the removal of color, that they can now pretty well control color and get out the color. In your evaluation, do you believe that this is feasible and can be used in your Southland works, or that it needs further evaluation?

MR. GRIBBLE: In my opinion, based upon the latest information available to me, it still requires further evaluation. The one company I am aware of that has had success in this area is a small board mill in southeast Georgia at the edge of the swamp where they have got plenty of land area and they are not worried with the sludge disposal problem.

R. Mattern

In the case of our plant, massive lime treatment would require extensive land areas plus the problem of the disposal of the lime sludge.

CHAIRMAN STEIN: Thank you.

I think we are talking about the same plant, and we are obviously both evaluating the same one.

Thank you very much, sir.

MR. KECK: Next is Shell Chemical Company of Deer Park, Texas. They are represented by Mr. Robert Mattern, Technical Manager, Deer Park plant.

Bob.

MR. YANTIS: You get a gold star for giving the secretary the first copy.

MR. ROBERT MATTERN

TECHNICAL SUPERINTENDENT

DEER PARK PLANT, SHELL CHEMICAL COMPANY

DEER PARK, TEXAS

MR. MATTERN: Thank you.

Mr. Chairman, conferees and ladies and gentlemen. I am Robert Mattern, employed by Shell Chemical as Technical Superintendent of the company's

R. Mattern

Deer Park plant. Our plant is the largest petrochemical plant on the Houston Ship Channel and produces industrial alcohols, ketones, and various other organic chemicals and resins. Our production capacity has grown from about 1 billion pounds per year in 1965 to about 4 billion pounds per year today, although we have been operating at reduced rates for more than a year due to economic conditions.

During this 6-year period, our efforts to control wastewater effluent have been intensive, so that despite an almost fourfold increase in production capacity, the total organic load of our effluent before treatment has remained essentially the same. This has been accomplished by process and equipment changes, extensive water reuse, good housekeeping, and an increased awareness by our employees of the need to control our effluent. Also, during this period our BOD level of our effluent, after treatment has been reduced over 95 percent. This reduction has not, however, been obtained without technical problems and significant effort, which I would like now to briefly review.

R. Mattern

In 1965, our effluent met all effluent standard requirements established by the Texas Water Quality Board in December of that year, except for BOD and COD. In order to bring our effluent into compliance on these 2 parameters we engaged the services of a consultant in the spring of 1965 to make engineering studies and to provide the basis for the design and construction of a secondary treatment plant. The design was completed in August 1967, and construction was complete in December 1968.

This 3-year period was required because of the extended laboratory and pilot plant studies needed to apply biotreatment to our particular wastes. The facilities were started up in January 1969, but did not achieve the BOD reduction. Further pilot plant and laboratory studies, including fundamental studies, were then carried out to define the corrective action and additional facilities needed. It became apparent that both increased aeration and retention time were required. Redesign of the facilities was completed in November 1969. At that time we presented our proposed construction schedule of the additional

R. Mattern

facilities to the Texas Water Quality Board, which they approved, provided we bend every effort to improve the quality of our effluent in the interim.

In order to most rapidly achieve improvement, additional aerators were installed in June 1970, and construction of all facilities was completed by February 1971, well ahead of our schedule. Since that time we have achieved BOD reductions of well over 90 percent and the effluent BOD levels have been significantly lower than our permitted level.

During this same 6-year period, our full-time professional, technical manpower assigned to pollution abatement has grown from 2 to 10. We are continuing to utilize this technical manpower to further improve our effluent quality. Because of the state of the art, however, we expect that improvement will be even more difficult and time consuming than in the past. This review has been presented not only to show our policy and implementation record but to point up the time required to accomplish a desired goal.

I should now like to comment on the report which is the basis for this conference as it concerns

R. Mattern

Shell Chemical. We are mentioned as discharging 550 pounds per day of zinc into the Houston Ship Channel. This statement we understand is based on a single grab sample taken in February 1969.

The report does state that these data may not be representative and that further samples should be obtained. With this statement we thoroughly agree and can assure you that the analysis is not representative, as we have numerous samples which show zinc levels far lower than the value given in the report. The average of all of our analyses is less than 5 percent of the reported values. Since we do not produce zinc nor use it in any significant quantities, the likelihood of the reported value is very low, and we would have appreciated more prompt notification than the present report so that we could have clarified the situation.

Also in this report we are mentioned as being permitted to discharge 1,270 pounds per day of oil and grease into the Houston Ship Channel. Our effluent treating facilities effectively remove all free or floating oil. Our actual analyzed oil and

R. Mattern

grease load is only about 10 percent of the permitted value. This is not to indicate however, the permit is too lenient, since there needs to be an allowance for upsets which do occur, although infrequently. The value mentioned in the permit, however, refers to material extracted from the wastewater by an organic solvent and includes material other than oil and grease.

In closing, I submit that Shell Chemical's Houston plant, in response to the regulations and guidance of the Texas Water Quality Board, has made orders of magnitude improvement in the quality of our discharge into the Houston Ship Channel while greatly increasing production. In so doing, we have also made significant contributions to the technology of the biological treatment of dissolved organics. We are dedicated to a continuing effort, aimed, where feasible, at further improvements in quality.

Thank you. (Applause.)

MR. VANDERHOOF: Mr. Mattern, I recognize that you have a difficult problem, but, in your opinion, do you believe that only conventional

R. Mattern

secondary treatment or its industrial equivalent will be required to meet the water quality standards on the Houston Ship Channel?

MR. MATTERN: I simply addressed ourself to our permit at this permit level at this time, Mr. Vanderhoof.

MR. VANDERHOOF: Thank you.

MR. YANTIS: I would make one brief comment.

The Water Quality Board, has, under the Water Quality Act, the right of following certain procedures which safeguard both the permit holder and public to amend or seek to amend any permit. This can, of course, be appealed to the court by either party who may feel he is agrieved, but the Water Quality Board does not feel that any permit gives a vested right to continue at that permit level, and the law specifically states there is no vested right.

We feel that improvements are made on an incremental basis, especially when there is not yet the capability of well-defined, well-documented plans.

R. Mattern

So we consider at the present time that essentially every permit issued on the channel, including the new ones and including those companies who have built new facilities, should still have an interim facility with no bargains requiring additional requirements, since they will have in most cases biological treatments.

There are really only 2 things left -- control of the process itself or some form of chemical treatment. In many cases, as you go to extremely pure effluents, you are getting out of the field of water pollution control in the first place, and approaching a whole water reuse field which requires some additional thinking.

But in summary, there is nothing to bar adding extra treatment chemicals or otherwise where the need is shown.

MR. KECK: Our next speaker comes from the Texas City area, which is not on the Houston Ship Channel, as everybody saw when the maps were put on the screen during the last couple of days.

Representing Union Carbide Corporation, Chemicals and Plastics, Texas City plant, is Jack F.

J. Erdmann

Erdmann, Environmental Coordinator.

Mr. Erdmann?

JACK ERDMANN

ENVIRONMENTAL PROTECTION COORDINATOR

UNION CARBIDE CORPORATION

CHEMICALS AND PLASTICS PLANT

TEXAS CITY, TEXAS

MR. ERDMANN: Chairman Stein, Mr. Vanderhoof, Mr. Yantis and ladies and gentlemen. I am the Environmental Protection Coordinator for Union Carbide Corporation Chemicals and Plastics plant located at Texas City, Texas. I would like to present a statement indicating the degree of improvement achieved in our industrial waste treatment and disposal operations in recent years at this plant location.

Before the Texas Water Quality Board was formed, we had begun a planned program for the segregation of plant wastes to reduce the pollution load to Galveston Bay. At the same time, research and development efforts were undertaken to determine the best methods for secondary treatment of the plant effluent streams. These streams are segregated into

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the following categories: 1) Burnable residues; 2) Concentrated aqueous wastes; 3) Dilute aqueous wastes.

At the present time, about 50 percent of the total falls into the burnable classification. These materials are burned smokelessly in special burners or used to supplement fuel values in various process furnaces and never become a part of the wastewater picture. The concentrated aqueous wastes are collected from specific production facilities in a special pipeline or by vacuum trucks for transport to a series of lagoons which afford about 90 percent reduction in BOD content by anaerobic and facultative bacterial action.

About 25 percent of the total plant load is treated in this system. The dilute aqueous wastes amounting to the last 25 percent of the plant load are collected continuously from the many operating facilities in the plant, then neutralized and given primary clarification before flowing to the bay. These two streams, the concentrated and dilute wastes, are the ones to be treated in the facilities mentioned in the Gulf Coast Waste Disposal Authority's presentation

J. Erdmann

which was made earlier this week.

At the May meeting of the Texas Water Quality Board, a waste control order was approved for a 2-phase implementation program in a cooperative agreement between the Gulf Coast Waste Disposal Authority and Union Carbide for secondary treatment of these aqueous waste streams. Phase I, to be completed by July 1973, calls for the financing, construction, and operation of new primary and secondary treatment facilities by the Gulf Coast Waste Disposal Authority to provide a BOD₅ reduction of over 90 percent of the dilute and concentrated aqueous waste streams, on an engineering design basis.

Phase II of the program calls for a further improvement by additional BOD removal to over 97 percent by various technology improvements, several of which are now being tested in our laboratory. Extensive laboratory and pilot plant work to determine the best methods for achieving this high degree of reduction of our particular waste mixes has been under way for the past 5 years at a total cost of over \$1 million.

In connection with the 2 aqueous waste

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streams previously mentioned, steady reduction has already been accomplished through a systematic inplant control program. This program is based on a sampling network throughout the plant with analytical determinations by 2 very rapid and reproducible instruments: The Total Carbon Analyzer to spot trouble points and to give a plant balance quickly and accurately; and the Chromatograph to properly identify materials qualitatively and quantitatively for source determination. These daily results are promptly reported to operating supervisors so that corrective action can be taken immediately. Technical evaluation of summarized data of this type often leads to engineering projects for process improvements and better abatement systems in the production areas.

By the end of 1970, these efforts had resulted in a dilute waste load reduction to a level 75 percent of that in 1963, while at the same time the plant production index rose to 220 percent of the 1963 level. Said in another way, while our production has more than doubled, our waste load was reduced 25 percent.

J. Erdmann

A summary of our monthly average BOD and COD loads indicates we have been within our statutory permit levels since January 1969. This program at the plant involves the full time of 15 engineers and technicians and costs over \$500,000 per year to maintain. The information developed is provided to our own personnel to be used in many different ways for the control of wastes as close to the sources as possible.

We provide a monthly summary to the Texas Water Quality Board in a self-reporting system required by recent regulations. We would be pleased to discuss this program and the data developed from it with any agency personnel who may be interested.

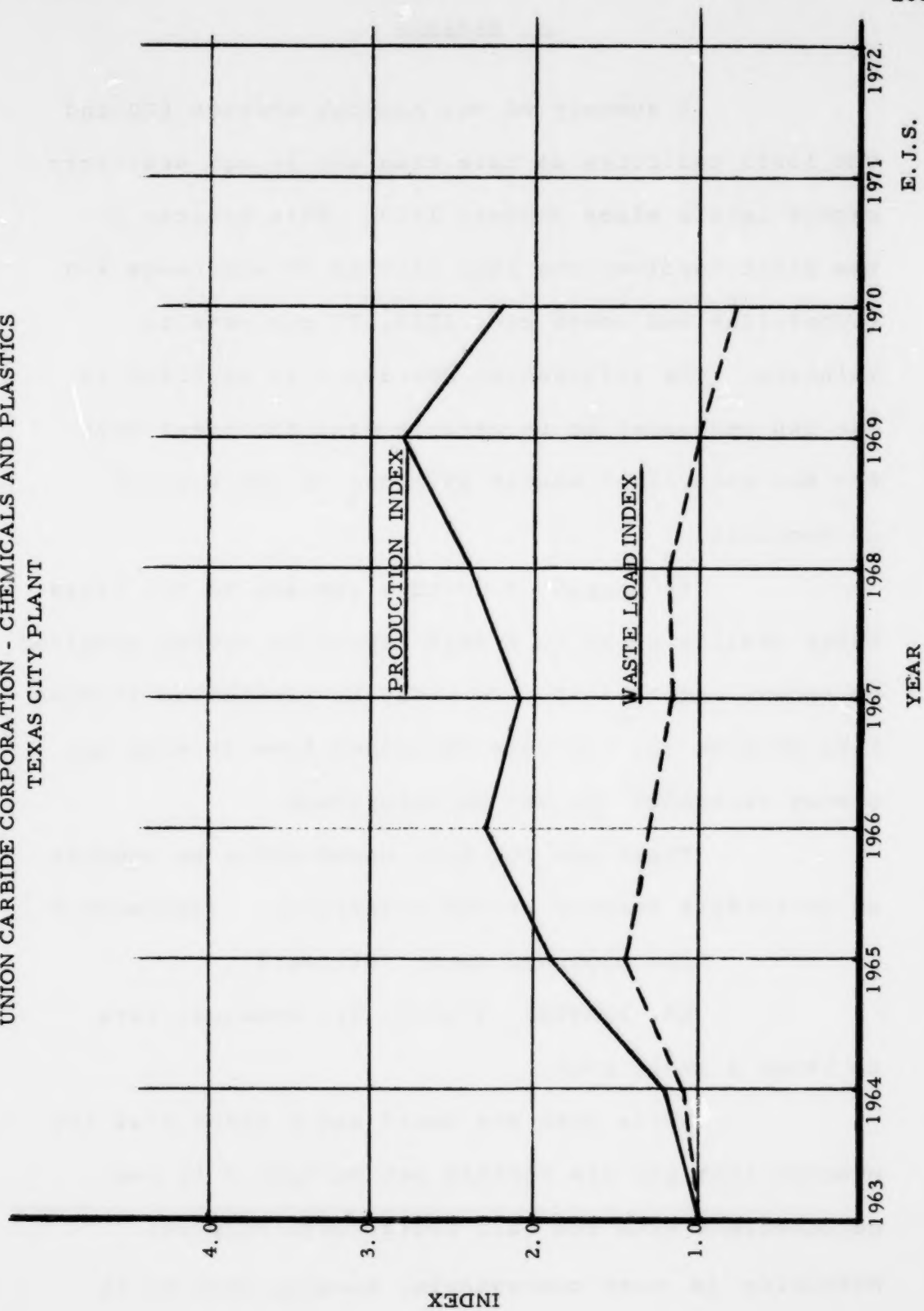
Thank you for this opportunity to present an up-to-date summary of our activities. (Applause.)

[An appended chart follows.]

MR. YANTIS: I will, Mr. Erdmann, have to throw 1 small rock.

While both the board and I think that the program that you are working out on Page 2 in your negotiations with the Gulf Coast Waste Disposal Authority is most commendable, knowing what is in

WASTE LOAD VS. PRODUCTION TRENDS
UNION CARBIDE CORPORATION - CHEMICALS AND PLASTICS
TEXAS CITY PLANT



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your statutory permit, I wouldn't brag too much that you have been meeting it since January 1969. I know you have, but it wasn't much of a permit. (Laughter.)

MR. ERDMANN: Well, if you are referring to the fact that I mentioned that 1969 was the last time that we were over on BOD, I never went beyond that point --

MR. YANTIS: I am pointing out I appreciate that.

MR. ERDMANN: Good.

MR. YANTIS: We did, though, go from your statutory permit level to the program that we are working out with you now.

MR. ERDMANN: Correct.

MR. YANTIS: Because the level allowed in 1969 was pretty bad.

MR. ERDMANN: That's true. We realize that. At the present time, however, we are well below that.

CHAIRMAN STEIN: Mr. Erdmann, can we have another copy of that chart you have at the end?

MR. ERDMANN: Yes.

J. Erdmann

CHAIRMAN STEIN: You see, those lines will not reproduce.

MR. ERDMANN: I have a transparency, but I will have to bring it later.

CHAIRMAN STEIN: Thank you.

MR. VANDERHOOF: Mr. Erdmann, I have one question.

MR. ERDMANN: Yes?

MR. VANDERHOOF: I know the nature of your plant does result in large nitrogenous loads and are not accurately represented by the BOD. Do you believe that the COD restraints in your permit covers this situation?

MR. ERDMANN: Did you refer to nitrogenous loads?

MR. VANDERHOOF: Yes.

MR. ERDMANN: What were you referring to specifically?

MR. VANDERHOOF: Well, in the problems up in Kanawa -- and I am well familiar with your plant in Kanawa -- they did have problems with the nitrogenous stages being very large. It may be that your nitrogenous element of the BOD function is not

J. Erdmann

present in the type manufacturing process you have here. This is what I am inquiring about.

MR. ERDMANN: No. You are correct, sir. We do not have the same process here that we have in the plant on the Kanawa. We do have one source of nitrogenous loads here which we have determined have been used by the bacterial population as a nutrient to some degree.

It is a means very similar to ammonia, and our pilot plant indicates this can supplement the nutrient requirements system. But we do not have the same product in Texas City as we do in the West Virginia plant at all. It is quite different.

MR. VANDERHOOF: Thank you very much.

MR. ERDMANN: You are welcome.

MR. KECK: I guess he was a little eager to get up here is why he hit that bottom step so hard.

Our next representative is representing Charter International, which to those of us who have been around Houston awhile -- it used to be Signal Oil and Gas.

Charter is represented by Mr. Chester L.

C. Strunk

Strunk, Vice-President of Refining at the Houston plant.

Chester?

MR. CHESTER L. STRUNK

VICE-PRESIDENT OF REFINING

CHARTER INTERNATIONAL OIL COMPANY

HOUSTON, TEXAS

MR. STRUNK: Mr. Chairman, conferees, ladies and gentlemen, I am C. L. Strunk, Vice-President of Refining, Charter International Oil Company. Although I am not a native Texan, I have lived in southeast Houston some 25 years and have worked in this refinery for over 21 years.

The Charter International Refinery originated in 1942, built by the Government as a high-octane, aviation-gasoline plant. In 1946 the plant was acquired by Eastern States. The refinery is located in the Manchester subdivision in the city limits of Houston on about 150 acres of land. Twenty percent of this area was acquired since 1959 by the purchase of individual lots and houses from residents in the area.

The refinery parallels the Houston Ship

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Channel for about 3/4 of a mile. The widest part of the plant is some 1,400 feet. We operate a fully-integrated petroleum refinery, with 20 different processing units and 2 catalytic cracking units, charging 65,000 BPD of sour West Texas crude. Please keep this information in mind when later I discuss our present pollution control program, as this land limitation played an important part in the selection of pollution control equipment.

From 1946 to 1961 the emphasis on pollution control, both air and water, was not as great as it is now, although at one time, over 10 different governmental agencies, local, State and Federal, had some form of pollution control or interest along the Houston Ship Channel. In 1955, the management of the then Eastern States assigned a chemist, with a degree in bacteriology and previous experience in water analysis and research work, full-time to pollution control.

From 1955 to 1959 considerable amount of effort, time and money was spent on pollution control. Two sour water strippers were put in service on process

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streams, a pH controller and recording system added to the effluent water, and the existing API oil separators were improved. During the next several years, after the refinery was acquired by Signal Oil and Gas Company in 1959, considerable money was spent modernizing and improving the existing facilities. This work, plus increased emphasis on good housekeeping, helped in improving the quality of the effluent water.

In 1962 when the Texas Clean Water Act was passed, a consulting firm was hired to prepare a master plan for pollution control. In 1965 this firm was replaced by our present consultants, Brown & Root, Inc., and in the same year, an extensive pilot plant study was made, operating around the clock for 3 months, with 3 different types of equipment -- a flocculation unit, a trickling filter, and a microscreen filter unit.

Later that year, Brown & Root, from data collected from the pilot plant work and post-laboratory analysis of both stream analysis and effluent analysis, submitted to Signal a design report for waste treating facilities.

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In January of 1966, with the full approval of Signal's Board of Directors, an extensive program for quality improvement of effluent water was presented to, and accepted by, the then Water Pollution Control Board. Even though we stated then that the object of our program was to produce a quality of water well within those quality guidelines as set by the Texas State Board Order No. 65-9, our goal was and still is to produce the "best possible quality water."

In 1967, in conjunction with our pollution-control-improvement program, Signal made an application for a Research and Development grant from the then Federal Water Pollution Control Administration. The project objective was to investigate the practicability of treating total refinery wastes in cooling towers and to investigate the possibilities for effluent water reuse. This grant application was temporarily shelved in 1968 when we realized we could not dovetail the grant application into our improvement program without slowing down the latter program.

The idea of effluent reuse is still the prime interest to us, and additional studies and work

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will be done in the near future, with or without the development grant. It is indeed unfortunate that the very ingredient you need in a biological unit, bacteria, are the very things that gives problems in a cooling tower.

As mentioned before, the lack of available land is a prime problem in the refinery. Extensive studies were made to find a suitable area for the waste treating facilities, and finally 2 sites were selected adjacent to the existing oil separators. One area contained 30,000 square feet while the other had only 15,000 square feet; both areas had to have existing structures, pipe cracks and sewers removed or rerouted. Because of the limited space and the number and types of units needed, it was decided to design the system to handle a hydrologic loading of 3,000 gpm. When we started the program our average flow rate was from 1,500 to 1,800 gpm; an extensive water conservation, paving and water reuse program reduced the monthly average to 1,000 gpm. Rerouting the blowdown water from eight other cooling towers to one which consistently had a low cycle of

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concentration greatly reduced the need for blowing down cooling towers.

In the early part of 1967, construction was started on the 1,800,000 gallons (40,000 bbls.) equalization tank. This tank is an open-top, steel tank, 40 feet high and 90 feet wide, equipped with a 30-HP circulating pump with an 18-inch suction line and a 16-inch discharge line. On the discharge line, located 5 feet from the bottom of the tank, is a 4-inch jet nozzle for mixing purposes. Retention time in the tank is from 18 to 36 hours. The tank plus the auxiliary pumping equipment just fits into the area. In 1969, a flow controller valve was put on the equalization tank discharge line, and in April of 1970 a 30-HP floating aerator was put in service in the tank.

In the latter part of 1968 after an extensive laboratory testing program, construction was started on a 500,000-gallon Emico clarifier. This is a 75-foot by 15-foot steel tank -- that is 75-foot diameter -- with an external, rapid-mix tank. In this rapid-mix tank, various chemicals are used for

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floculation with calcium carbonate added as a weighing agent. This unit was designed for a rise rate of 0.5 inches per minute rather than the conventional rate of 1 to 2 inches per minute. To handle the sludge produced, 2 solid bowl desludgers were purchased. This unit was put on stream in March 1969.

In April of 1970, a 500,000-gallon Infilco Acceltor activated sludge unit was placed in service. This is also a steel tank 85 feet by 22 feet, with a 60-HP Voite-Mix aerator and three 745-SCFM blowers.

As each unit went on stream, we found problems both with the equipment and in producing the desired quality of water. As time went by, we improved the equipment, gained experience operating the units and improved the quality of the water. The biological unit, which is the third phase, has been the most difficult to master. This type of unit is completely foreign to a petroleum refinery and does not readily respond to instrumentation.

The first 6 months of operation was spent getting the feel of the unit and trying different approaches. In October, this last October, it became

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apparent to us that somehow the quality of the influent had changed and that we were having problems with the biological unit that our previous testing program had not uncovered. In November, at our request, Brown & Root proposed a 2-phase extensive testing program to improve the performance of our waste treating system. The first phase was a complete laboratory evaluation of the day-by-day performance of our biological unit and the training and upgrading of our laboratory personnel.

I would like to comment here outside of this text for a moment. From the period of time -- from October to April, our self-reporting had indicated to the State Water Quality Board, as well as some samples they were catching, that we were having trouble, and we appeared before the board at their request in April and outlined for the board and their staff what our program was. We are at this time working very closely with the Texas Water Quality Board staff in implementing this program and carrying on every activity that can concurrently be done in order to solve the problem that now exists. I might say that that is an

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intermittent problem. It is not one which occurs everyday -- "You are out of compliance" or "not meeting what we expect out of a unit." Today it is functioning very properly and has been for the last 2 months.

I will continue reading.

The second phase was to:

- 1) Evaluate inplant wastewater streams to determine the possible source of continued shocks to the biological system.

- 2) Evaluate the need for additional inplant monitoring systems to enhance the operational efficiency of the treatment plant.

- 3) Determine the effects of inplant operations on the efficiency of the wastewater treatment facilities.

- 4) Such other studies, investigation and assistance as may be requested by Charter Oil or as might be indicated by the foregoing studies.

This would be accomplished by:

- 1) Supervising the sampling program and assisting with the associated analytical work to determine

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contaminant concentrations in the wastewater at various significant points in the plant.

2) Determining the need, type and location of inplant monitoring required.

3) Operating and monitoring bench scale biological reactors to determine the effects of variations of inplant streams on the biological unit.

4) Analyzing the collected data and publishing report summarizing all work performed and containing: a) Conclusions regarding the effects of inplant operations on the performance of the waste treatment facilities; b) Recommended courses of action for increasing treatment plant efficiency.

This unit is as important as, if not more important than, any other unit in the plant, and as such is in the operating department. There is 1 man per shift assigned to this unit, plus one chief operator per shift, plus one unit supervisor, and 1 area supervisor -- all under a department manager.

In addition, there is a chemical engineer from the operating department assigned to the technical operation of this unit; our environmental engineer,

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whom I mentioned before, with 18 years of pollution experience in our refinery; one chemist on full-time; and 2 laboratory technicians on part-time basis. We also use the Edna Wood Laboratories, Brown & Root, and various other water treating consultants.

The refinery's control program has greatly improved the overall quality of the effluent water. As each unit has gone on stream, there has been a substantial reduction in the pound per day of pollutants present in our effluent water. Our treating efficiency now shows a 92 to 95 percent improvement. We have not progressed enough into our present program to know the maximum efficiency or maximum removal of pollutants we can accomplish. We will do what sound technical and engineering studies determine that we are able to do.

CHARTER PHILOSOPHY

Charter International Oil Company acquired this facility on January 1, 1971. The parent company, Charter Companies, is located in Jacksonville, Florida. Their philosophy is the same as Signal Companies' was -- to be a good neighbor in the community and to meet the

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responsibility of acceptable water effluent.

I thank you gentlemen for being here today.

(Applause.)

MR. VANDERHOOF: Mr. Strunk, I am pleased to hear that you have solved the operating difficulties of your plant. I know that you are working very hard to do it.

I do have one question. Do you have a fail-safe system, i. e., one that would catch any spill of oils in your plant?

MR. STRUNK: When you say "fail-safe," I hesitate to answer a direct yes or no when you are talking about an oil spill inside an operating unit.

MR. VANDERHOOF: Yes, sir.

MR. STRUNK: We have the usual facilities that any refinery would have to do this. "Fail-safe?" Nothing is fail-safe. You have got people, equipment, automation. There is always a time that something could happen that you do not cover, but we feel we do have a very successful operation and feel that we are able to contain anything that we normally would expect.

MR. YANTIS: Let me make a comment.

C. Strunk

MR. VANDERHOOF: For the record, Mr. Strunk has been most cooperative and has furnished us any information needed, and I do appreciate it.

MR. YANTIS: I think that is a very pertinent question, and this is an area in which the Water Quality Board is moving, but has moved slowly because of lack of personnel.

We held a series of public hearings up and down the Coast, over a year ago, to provide the legal basis for regulating the -- call them "fail-safe" -- devices of this kind.

But, more than that, well, as we have time -- this simply means the number of people to develop it and do it -- I think we will have those, and we will require the type of cleanup equipment around the loading dock that is either there as a group or as an individual plant and the type of retaining dikes that go around storage tanks and things of this sort.

We are very concerned with the security of storage at any processing unit, but, most of all, at points of loading. There have been cases of truck

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drivers simply going to sleep and letting their trucks overflow. It does not happen as much in an actual processing unit.

Back when I used to work in them, if you did that, you got fired immediately. But it is a problem that when something is spilled, it should be caught. We know of one industry in a remote part of the State from here that had something fail in a small pump room, and oil went to a little sump and out into the river for 24 hours before it was caught, and it was caught 7 or 8 miles downstream by the game warden.

So, again, correction has been taken. But it is a valid point that all industries will be required by us -- whether it will be a Federal law before that or not, I do not know -- but there will be requirements simply having to do with prevention of things leaving your plant independent of the quality of your effluents.

CHAIRMAN STEIN: I am glad you both brought that up because I think, particularly with industry such as we have here, I would like to make another comment.

As you know, we are charged with enforcing the law as it stands, and if we have oil spills now, the Government will ask the person or persons responsible

C. Strunk

for that spill, whatever the reason for it, to clean it up. If they don't, then the Government will do this itself. But then it is my job to move ahead and not only get the cleanup done but recover the money that we spend.

We have had several oil spills in which we have applied this process. However, they were not in this area of the country. When we did this with a relatively large oil company -- they didn't have fail-safe devices -- the settlement was very large indeed. But when we did it with a small oil company in the Philadelphia area, given what the law was, I was a little dismayed by the apparent results, because the amount was so great we were going to throw the company into bankruptcy. As a matter of fact, they filed bankruptcy, and it took heroic efforts in court to get something set up whereby we wouldn't put them out of business. I don't think the purpose of pollution control is to put someone out of business.

However, the point that I am making is given the Federal law now, we can get recovery of this into the millions of dollars, and unless you have fail-safe

C. Strunk

devices, this can prove very, very expensive indeed to the companies.

I would suggest that you give consideration to fail-safe devices and prevent that kind of awkward situation, because this is the worst situation we and the company can get into. Not only do we have the oil spill and that miserable publicity, but we also have the aftermath of dealing in very, very large sums of money which is accountable for the cleanup.

I would like to call attention to one more point in your statement, which I believe is a very, very good one. I indicated when we started earlier that -- I believe in the first stage we had a little discussion of the difference between the biological and physical chemical techniques. I think the experience of Charter International shows what happens when we are dealing with what we broadly used to call secondary treatment in getting 50, 60, 70, 80 maybe 90 percent BOD reduction. We employed the biological techniques within a broad spectrum, and this could be done although there were considerable variations. As we go up to these very, very high degrees of removal

C. Strunk

that we are talking about now -- and I recognize that Charter International has a space problem -- and we pick a biological technique with the variations in operating the systems that we have heard of today, I believe we can all expect we are going to have to take on very, very careful management of that biological system if we are going to achieve results in terms of 95, 96, 97 percent removal.

Now, again, I am saying this to this audience because I am almost reminded of experiences that I have had in the past. I don't like to make analogies like this, but we must almost operate like we had pharmaceutical houses putting out something.

If you are operating a biological technique and you are depending on that to come within a couple of percentage points of 100 percent, I think we are going to have to recognize the necessity to exercise this extraordinary care. The experience we have just heard will give you an insight into the problem that we face as we try to achieve the high degrees of treatment.

Thank you very much, Mr. Strunk.

MR. STRUNK: All right.

R. Somers

MR. KECK: Next is the Petro-Tex Chemical Corporation.

They will be represented by Mr. Ralph Somers, Manager of Utilities.

MR. YANTIS: And sometimes Mayor of Friendswood. (Laughter.)

MR. RALPH SOMERS

MANAGER OF UTILITIES

PETRO-TEX CHEMICAL CORPORATION

HOUSTON, TEXAS

MR. SOMERS: Mr. Chairman, Mr. Yantis, Mr. Vanderhoof, ladies and gentlemen. My name is Ralph Somers. I am the Utilities Plant Manager of Petro-Tex Chemical Corporation.

I have a prepared statement, but I want to preface my remarks in the statement with an addition which is needed for the record. That is the location of the plant. Our plant is located on Sims Bayou, roughly 1/4 of a mile upstream from the Sims Bayou plant of the city of Houston. Our discharge does find its way into the Houston Ship Channel.

I further would like to preface this

R. Somers

statement with an observation which occurred to me this morning. In reading the Houston Post, and particularly reading Miss Caudill's report of her interview with Mr. Stein, it occurred to me that we are a conference here being conducted under the control of a vast amount of experience and effort and dedication to environmental control. Mr. Stein has been in the business a long time. Mr. Yantis, we know, has been in the business a long time. And the progress that these people have made together over the past 10 years, in particular, shouldn't go unrecognized in our emotional output that overcomes us from time to time. At least, if anybody feels that industry has had an easy time with the Texas Water Quality Board, I can testify from my own personal experience they at times have been unreasonable, I think. (Laughter.)

I lost the argument most of the time, but, at any rate, it is not an easy touch. We don't have this in mind at all. I will go back to the prepared statement.

Our purpose for making an appearance at this hearing is to tell you briefly our development story of wastewater treatment to demonstrate that this

R. Somers

industry has long been aware of its impact on our environment. Petro-Tex Chemical Corporation is primarily a butadiene producing facility with other major products being dibasic acids, neoprene rubber, alkylate, and olefin hydrocarbons. We are members of the Houston Chamber of Commerce and will present to you factual data supporting Mr. Keck's statement that real progress is being achieved on the Houston Ship Channel and as a result, an improvement in Galveston Bay.

Petro-Tex was founded in 1955. The Houston butadiene plant was purchased from the Federal Government. The plant was designed and built during World War II by the Federal Government as a portion of a synthetic rubber complex needed to augment the Nation's dwindling rubber supply. Existing pollution abatement facilities were meager at the time of purchase, consisting of an API oil-water separator and an Imhoff tank. The plant facilities have been greatly expanded since the purchase. Today, Petro-Tex employs approximately 1,000 people and has an annual payroll in excess of \$10 million. This plant produces roughly 20 percent of the raw materials needed for the Nation's

R. Somers

synthetic rubber requirements.

Ideally, the development of an effective water pollution control program should be a part of original plant design. Where this is not done, corrective action is sometimes difficult and hampered by necessary modifications of existing operating systems.

I might add it is considerably more expensive.

Our development story today covers a 10-year period. In recent years, needs and requirements have come more sharply into focus. We have identified problems and developed solutions. We have found the time cycle from definition to effective economic solution is most often measured in months and years.

I would like to enter into the record of the statement the overall treatment program at our plant includes primary, secondary and tertiary water treatment.

In the early sixties, Petro-Tex recognized that waste effluent treatment was a necessary part of

R. Somers

production and process development. We were then developing a new process for producing butadiene. In the course of this study, we developed a major new waste treatment process which was applicable to our needs. The process was patented and has been made available to others at no cost. We have received and replied to some 450 inquiries from universities, industrial concerns, foreign governments, and individuals.

The paper has listed 13 items, dated 1962 to 1965, and, in addition, I have an attachment that includes 35 line items which we think are worthy of noting. I want to touch on selected items from the 13 I think are worthy of mentioning.

The process I just mentioned is a biological process, Item No. 1 on Page 2. This process was developed between 1962 to 1965 and does consist of an area of the lagoons. The uniqueness about this process is at the time it was probably the first -- among the first, if not the first -- large industrial type biological unit receiving a strong waste of a totally mixed feed and recycled liquor. We found this to give us a better, more

R. Somers

stable process, a betterment of controlling the output, much more resistance to shock, and as a result a generally improved operation. These lagoons at our plant are 540 feet long, 140 feet wide and 10 feet deep. We have 3 lagoons now. Originally there were 2 and, of course, they are followed by a clarification and sludge recycling.

The other thing that was just mentioned in the last presentation concerning a fail-safe system in oil is worthy of mentioning here.

In Item No. 2, I have listed here that we completely rebuilt an API separator for oil removal. This, in itself, is not too important. The important thing is that the API separator, even though with rebuilding it was a most effective unit, didn't meet all the requirements we felt it should have, and we installed a polishing unit downstream of that in the form of a lagoon with rows of skimmers removing trace levels of oil. We felt this to be very effective in eliminating floating oil that might otherwise escape to the bottom.

Item 3 I would like to touch on has to do

R. Somers

with alum sludge. Our process involves use of a relatively large amount of utilities. We, of course, have to take the water from the city of Houston, Lake Houston. We have to clarify this water for steam generation purposes. Naturally, alum is used for clarification. The results of this process is a blowdown stream containing about 4 percent solids consisting mostly of alum sludge and silt, and this has been one "bugger" of a problem as far as sludge disposal.

We started out with what we thought was a pretty good process, a pond. We spent \$10 million and ended up spending more and are not too happy. We hope there is an answer to handling the sludge. We are looking forward to that one.

The next item I want to mention is Item No. 5, the tertiary butyl alcohol removal. We found this to be a very big problem in our plant in that it was not biodegradable to the extent necessary, and we had to resort to other means. We eventually settled on steam distillation and have had a great degree of success in eliminating TBA going into the Bayou.

R. Somers

An item worthy of mention is Item No. 8, which has to do with self-reporting. This required what to us was a new thing, i. e., installation of monitoring equipment on effluent streams. We are 2/3 of the way on our program in this effort and hope to have it completed within the next few months.

Another item that is receiving considerable attention at Petro-Tex is Item No. 9 and has to do with water conservation. Our first real contribution in this respect was accomplished last year, and we were able to reduce our outfall by 1-1/2 MGD through better engineering and the use of our cooling water. We are still working on this as far as other aspects of the plant are concerned, and we hope to go further in reducing the outfall volume -- not necessarily the waste load reduction just simply water conservation.

The last item I would mention here is Item 13, which states that we are participating with the Gulf Coast Waste Authority in feasibility studies and have participated to the conclusion of Phase I for self-treatment. It is our intention to use the facilities of GCWA whenever they can do the job better

R. Somers

and get the job done.

The total cost, to give some appreciation of the 13 items that I have listed here, has been \$3.5 million capital investment. We are, of course, not through.

At Petro-Tex, we now have a total of some 24 different processes which affect or involve in some way water treatments to control waste streams. We do not mention this as an exceptional situation, but only mention it to illustrate the complexity in operating a modern plant while at the same time protecting the quality of our water. We will continue to meet environmental problems at our plant with a determination that corrective action will be effected in the shortest time necessary to implement real and lasting improvement.

We are committed to the economic improvement of the quality of wastewater effluents. The commitment was made more than 10 years ago. Water quality has improved. Improvement will continue in cooperation with Federal, State and local authorities. A necessary part of achieving results has been a knowledge and understanding of the quality standards

R. Somers

established by the Texas Water Quality Board. We believe that standards must be established and enforced that will provide this generation with the benefits of our economic activity, and preserve for future generations an environment that will support improved living conditions for an increasing population.

We are pleased to have been afforded an opportunity to participate in this hearing, and we are sincerely hopeful that we have contributed toward a better understanding and appreciation of efforts expended and commitments to the future. Thank you.
(Applause.)

Excuse me, Mr. Chairman. I have one other item I wanted to add to this.

CHAIRMAN STEIN: Yes?

MR. SOMERS: That is a correction that I think ought to be entered into the record. On Table VI-4, we believe that the zinc reported in our effluent is grossly in error. They report 196 pounds per day. We estimate something in the order of 4 pounds per day or less in our effluent,

MR. VANDERHOOF: Mr. Somers, I have one

R. Somers

question.

With respect to your monitoring program, are you planning on a bioassay as a part of your monitoring program in the future?

MR. SOMERS: We are now conducting all of the tests required or asked for by the State of Texas on a self-reporting program. That is, it does go into the State each month. Is this the gist of the question you have, sir?

MR. VANDERHOOF: I am just inquiring if you plan on some more sophisticated monitoring of your effluent?

MR. SOMERS: As has to do with the BOD, COD?

MR. VANDERHOOF: No. Where a proportion of your waste would be mixed with water.

MR. SOMERS: At the present time, a portion of our waste is mixed with living water. We have a little fishing pond where we demonstrate the purity of our effluent.

As far as bioassay, sir, I can't answer. I don't know if we have a particular plan in prospect unless we are guided by the State of Texas and are

R. Somers

directed to do so.

MR. VANDERHOOF: Will you consider it as a suggestion?

MR. SOMERS: I am sure we will consider it if you will suggest it or you people suggest it (indicating).

MR. YANTIS: I am not sure we would suggest it. We might order it.

(Laughter.)

MR. YANTIS: We, ourselves, have considered the routine use of bioassays in a place like the Houston Ship Channel as premature. We do think that they might well be required before so very long. Now, whether I am talking about 1, 2, 3 years, even 5, I don't know. In other parts of the State where they are more sensitive, we know they are coming.

There is a lot yet to be developed about them because -- well, you have freshwater, salt water, different kinds of fish, different kinds of organisms, or you want them to live 48 hours or a month, and are concerned with all sorts of things. It does take very

R. Somers

experienced people, very educated people, but properly used, I think they are a valid test and a valuable test. This is one of the few things I guess you would say that Walter Quebedeaux and I agree on. Now, we don't necessarily agree on the technique, how they ought to be run, but we do agree on their value. And I would expect to see bioassays come into play on a step by step basis over a period of time which I cannot name. But, we do not oppose them; we simply don't feel that we are geared up and ready for them.

MR. VANDERHOOF: This is exactly the point. I believe it is a technique of the future, and unless we take some learning at this stage of the game, we won't be ready when we can apply the technique.

MR. YANTIS: Well, that's probably true.

Mr. Chairman one semi-philosophical comment or question. It is simply worth checking. I do not vouch for the accuracy of it or exactly what it means. But I ran across some figures awhile back that said the Houston Ship Channel -- its construction, and, presumably its dredging and redredging -- I do not

R. Somers

know that this is correct, but my figures say it cost \$76 million and that in custom collections alone it has produced \$400 million. It also, in effect, produced the city of Houston.

But, I think whether these figures are right or wrong -- and I imagine the Chamber of Commerce could check them -- it shows that as an investment it has certainly been worthwhile.

Now, my announcement is -- Jene Farris, will you stand up so people know who you are?

(Miss Farris complied.)

MR. YANTIS: Jene Farris is the writer and administrative aide on my staff.

Remember yesterday there was a comment about going to a shrimp and oyster party somewhere down on the bay -- I believe Seabrook? It will be held tonight, and the time will be announced a little later in the day. The exact place will be announced a little later in the day. But I do want you to know that everyone from the press, the EPA, the Water Quality Board, county officials and city officials are invited. All who wish to go will sign sometime during the early afternoon or during the coffee break at the

registration desk in the lobby.

If there is any question, see Jene Farris. She is in charge of working out the details. We have arranged for a spirituous beverage -- beer, if you will. (Laughter.)

MR. YANTIS: There will be no cans to pollute anything or no bottles, I hope. But, anyhow, there will be cars leaving at 6 o'clock from the motor lobby for those who have no transportation. But those who do have transportation, it might be well for you to see Jene and see if you can help in the carpool.

Unless, Mr. Chairman, you have a further announcement --

CHAIRMAN STEIN: I would like to make a brief announcement because this deals with the festivities tonight.

I think we should keep in mind the figures we are talking about in dealing with clean water. I recognize what the Houston Ship Channel cost, and you heard those figures and what it means in trade. But just to give you an indication, I think

these figures are dwarfed by the money put in waters to keep them clean. In Washington, D. C., we expect the improvements to the Blue Plains system in the sewers to cost about \$300 million. And on the West Side of Manhattan, the plant going in now to create improvements is going to cost about \$220 million. And, across the river in Passaic Valley, where they have both industrial and municipal wastes, I guess it will be over \$300 million.

I think Mr. Yantis hit on a very, very important point. What we are talking about here is expenditures of a magnitude we have never talked about before to achieve clean water. And, again, I believe Mr. Quarles mentioned it when he was here.

Ultimately, the public has to determine what it wants and where it wants to put its money because it is going to pay for it in the end. These things, if we are going to get the water clean, surely are not going to be cheap.

MR. YANTIS: Now, we will break for recess.

There is transportation for everybody. So I would suggest, if you are not familiar with Houston and don't know where you are going, it would

be better to go down to the lobby and get another car.

I don't know where I am going, or where I have been sometimes.

We will break until 11:15.

We might run a few minutes after 12:00 so we don't cut ourselves too short.

(A brief recess was taken.)

MR. YANTIS: Will you come in and take your seats?

I have been reminded of an announcement. When I said "Water Quality Board personnel," I meant all State agency people associated with us in the presentations today. This does include the Health Department, Parks and Wildlife and whoever is here, the Governor's representative and Attorney General, etc. So, it is not a small group.

MR. CLARK: I would also like to remind you that the festivities tonight are sponsored by Mr. Emory Waite in Seabrook. He is the gentleman who came to us and told us the problem. He extends the invitation to all of the agencies.

Thank you.

MR. KECK: Are we reconvened?

A. Lee

CHAIRMAN STEIN: Yes.

MR. YANTIS: Well, do you feel pretty well collected?

MR. KECK: I am completely collected here.

Continuing with the industry presentations, we have the Lubrizol Corporation and Mr. Al Lee, the Plant Technologist of the Deer Park plant.

MR. ALBERT T. LEE

PLANT TECHNOLOGIST

DEER PARK PLANT

LUBRIZOL CORPORATION

DEER PARK, TEXAS

MR. LEE: Mr. Chairman, conferees, ladies and gentlemen. The Texas Water Quality Board established stringent requirements in its order on the quality of Lubrizol's wastewater effluent. The Lubrizol Corporation is operating its wastewater treating facilities to produce an effluent that meets the limits set by the Texas Water Quality Board.

Since early in 1968 Lubrizol has invested \$3.25 million capital investment in equipment and construction of more and better effluent treating and

A. Lee

control equipment. This is in addition to equipment already there at that time.

By far the largest expenditure was a \$2.5 million in 1970 for the installation of a wastewater treatment facility including oil separation, neutralization, primary chemical treatment, secondary treatment, and sludge disposal. This system was designed by one of the most prominent environmental engineering firms in the country and uses the most advanced technology available. The design capacity of the system is 1.5 MGD and it is being operated at approximately 600,000 gallons per day. This leaves considerable capacity available for expansion of processes.

With the above treatment system the BOD has been reduced about 90 percent and all parameters of the Texas Water Quality Board are being met.

The total investment of facilities for water effluent alone at Lubrizol is 12.3 percent of total plant investment. Operating costs of these liquid treating and solid waste disposal facilities run approximately \$900,000 per year.

Work is continuously in progress not only

Dr. A. R. Price

to operate the present equipment efficiently but to improve the processes and find better methods to handle the effluent from each process. (Applause.)

MR. VANDERHOOF: I have just one question. What is the name of this prominent environmental engineering firm?

MR. LEE: Roy L. Weston out of Pennsylvania, I believe.

MR. VANDERHOOF: Thank you.

MR. KECK: Next we have a representative of the Merichem Company, Dr. A. Roy Price, Executive Assistant to the President. Roy.

DR. A. ROY PRICE
EXECUTIVE ASSISTANT TO THE PRESIDENT
THE MERICHEM COMPANY
HOUSTON, TEXAS

DR. PRICE: Thank you, Dave.

Chairman Stein, conferees, ladies and gentlemen. Copies of this have been distributed to the reporter as well as the conferees.

My name is Dr. A. Roy Price, Executive

Dr. A. R. Price

Assistant to the President of Merichem Company.

Merichem operates a chemical plant located at 1914 Haden Road on Green's Bayou, a navigable tributary of the Houston Ship Channel. We collect and process waste caustic solutions as a pollution abatement service to some 100 petroleum refineries throughout the United States and Canada. For 25 years, Merichem has been recovering chemicals such as cresylic acid and sodium sulfide from these waste streams and recycling them back into the economy as raw materials for industry.

Contrary to a statement made on Page 58 of the March 1971 Galveston Bay Report, Merichem's effluent discharge is in complete compliance with its Texas Water Quality Board permit. For example, our 1971 monthly averages to date are shown on the following table and are all well below permitted discharges.

I will not read the table; I will read only the final line. For example, a permitted discharge rate of 225,000 gallons per day. The actual discharge average in the month of April was 13,000 gallons per day, less than 1/10. Oil and grease permit level of discharge, 37 pounds per day. Actual discharge, 1

Dr. A. R. Price

pound per day. Suspended solids, permitted discharge levels, 141 pounds per day. Actual discharge, 1 pound per day. BOD level discharge per day, 141 pounds per day. Actual discharge level, 5 pounds per day. And, finally, COD permitted discharge level, 563 pounds per day. Actual discharge level, 8 pounds per day.

The only effluent from the Merichem plant is boiler water blowdown from our own well, which is treated prior to discharge. The volume of this is small compared to the 150,000 gallons per day of water reused by our "zero effluent" process water control system. This unique system recently completed its first full year of operation, and even includes an arrangement of dikes and drains to catch and reuse all rainwater that might fall on process and storage areas.

I might interject, when I say "rainwater," it has been designed to protect the 50-year statistics of rain in the Houston area. That means we could catch up to 4-1/2 inches of rain in 1 hour or 11.5 inches in a single 24-hour period. Even before this system was installed, our effluent did meet our permit

Dr. A. R. Price

requirements. Attached to this statement is an information bulletin describing this system in more detail.

I would like to add that the total processed waste from the refineries that are brought into the plant amount to about 700,000,000 pounds per year and contain about 60 percent water. In spite of this, none of this water is actually discharged as an effluent. It either goes into our products, our processes or is reused as cooling water in our cooling system.

On January 28, 1971, representatives from the Environmental Protection Agency visited the Merichem plant and sampled its effluent. Merichem personnel collected a sample simultaneously. Our analysis showed complete compliance with permit requirements. Attempts to learn the results of the EPA Analysis have not been successful to date. Based on these facts, Merichem respectfully requests that the Environmental Protection Agency take appropriate action to correct the misstatement in the Galveston Bay Report.

Thank you very much. (Applause.)

[The above-mentioned information bulletin follows.]

E. I. G.

ECOLOGY TECHNOLOGY CURRENT EVENTS

Number 100

A MERICHEM REPORT

1076

PROGRESS! As Merichem enters its 25th year of operation, we like to think about the number of changes that have taken place over the years. Initially, we processed caustic wastes from petroleum refineries to provide a new source of cresylic acids. Our plant's primary aim was to meet demands of industry for these products and, at the same time, perform a pollution abatement service for the refineries. Back in 1947, however, only a few industry and health people were concerned about pollution.

TIMES HAVE CHANGED. Today, a clean environment is everyone's goal. Along with the rest of the nation, Merichem has developed an acute awareness of the need for more complete pollution control measures...even in our own back yard. Along the road to becoming the leading producer of cresylic acids, we also added sodium sulfides to our product list. Ever since the early 1950's, however, we have been budgeting pollution control equipment into our plant expansions.

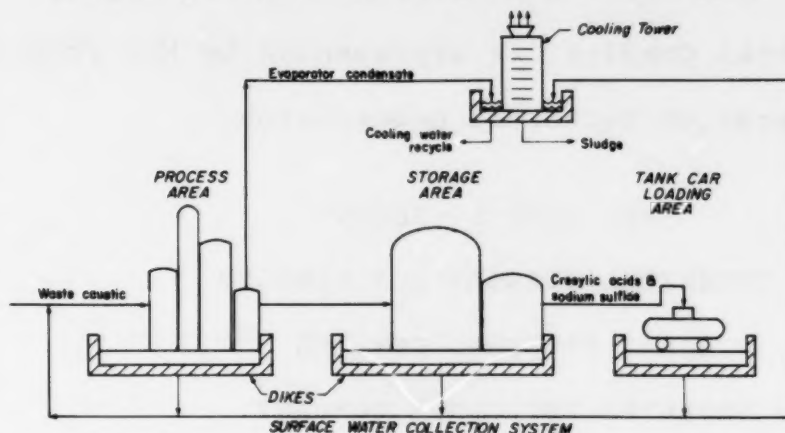
MERICHEM PROCESS WATER EFFLUENT...ZERO! Our engineers have been working for years to develop the water re-use system now in effect at the Merichem plant, which has been proclaimed by state and local officials as one of the most sophisticated in operation anywhere. Before installation of this system (which has just completed its first year of successful operation) effluent was subject to contamination by evaporator condensate and cooling tower drawdown which sometimes contained sulfides and phenolics from entrainment or process sources. In addition, phenolic materials are soluble in water, meaning that rainfall could produce a contaminated storm water runoff if there had been any leaks.

SOLVING THE PROBLEMS. The low mineral content of our evaporator condensate made it suitable as cooling water makeup, eliminating the need for any cooling tower drawdown. The natural biologic activity in the cooling water system degrades any phenolics, and the dissolved heavy metals keep the biologic growth in check. A small amount of sludge is periodically removed from the cooling tower and disposed of on plant property.

The surface drainage problem was solved in two ways: 1) an extensive piping system known as the "drip system" was installed to catch pump and valve leaks; 2) all process, storage and loading areas were curbed and diked, and drains were installed to send any other collected materials, including rainwater, to storage. Any runoff containing significant concentrations of phenolics is recycled directly to process for recovery and the remainder is used for cooling water makeup. The system design protects against a 50-year statistical rainstorm which, in the Houston area, would amount to about 4-1/2" in 60 minutes, or 11-1/2" in one day. The only effluent leaving our plant is a small amount of steam boiler water blowdown which is closely controlled to meet state quality standards.

con't.

Merichem Water Re-Use System Produces Zero Effluent Plant



AIR APPARENT. As in the case of water, Merichem's air quality control system was developed over a period of many years. If I had to pick a first step, I would choose our installation back in 1958 of a specially designed burner which eliminated a black smoke problem from a pitch burning operation. About the same time, we installed caustic scrubbers on vent gas streams to remove trace quantities of hydrogen sulfide and mercaptans to protect the growing community from unpleasant odors.

In 1965, we helped put into effect Texas' first Clean Air Act and installed in our plant additional smoke and particulate control units to surpass the new state standards. But, we realized that standards change...constantly. So, Merichem continued to revise and update its air quality control system.

In 1967, we completed an extensive piping and incinerator system to collect and burn any odorous gases that might get past the caustic scrubbers. The incinerator unit uses a specially-designed ultrasonic burner to achieve complete combustion of a heavy pitch-like residue and vent gases simultaneously. The heat is used to generate steam for general plant needs.

Today, our engineering staff is continuing its work to further improve our air control system as new state and federal standards come in effect to control emissions that were not even a recognized problem only a few years ago.

CAN WE HELP? What has met Merichem's water and air quality control needs may or may not be the answer to other situations, but if you think any of our ideas might be applicable to problems you know of, we'll be glad to give you more details. We are proud of both of our environmental control systems and invite you for a first-hand personal inspection...just call our office at (713) 224-3030 and we will be glad to arrange it. It would give us a great deal of pleasure to show you the key features of our air and water system that have helped make the Merichem plant an exemplary operation to refineries, customers, and the local community.

JOHN T. FILES
President

J. B. Scott

CHAIRMAN STEIN: All right.

MR. KECK: Phillips Petroleum Company, Adams Terminal Complex, is represented by Mr. John B. Scott, Manager, of Technical Correlation.

MR. JOHN B. SCOTT

TECHNICAL CORRELATION MANAGER

ADAMS TERMINAL COMPLEX

PHILLIPS PETROLEUM COMPANY

PASADENA, TEXAS

MR. SCOTT: Mr. Chairman, conferees, ladies and gentlemen. First, I must apologize to the panel and to the press for the lack of copies of this statement. In light of the proceedings of the past 3 days, we revised and sharply curtailed our statement, and this was done late last night without the benefit of copying facilities.

My name is John B. Scott. I am the Technical Correlation Manager for Phillips Petroleum Company's Adams Terminal Complex located on the Houston Ship Channel near Pasadena, Texas.

Phillips as a company and I as an

J. B. Scott

individual welcome the opportunity to tell you briefly about our efforts to improve the quality of the water in the Houston Ship Channel and Galveston Bay.

Adams Terminal produces a variety of petrochemicals including polyethylene and polypropylene plastic resins, ammonia, and other chemicals. During recent years a number of water pollution control measures have been initiated at Adams Terminal to prevent waste from these operations from adversely affecting the environment. Separators have been installed to remove solids and hydrocarbons from the process wastewater, a unit has been installed to treat better the sanitary sewage, and changes in manufacturing processes have been made to reduce to acceptable levels certain metallic contaminants.

Most wastewater discharged from plant processes goes through holding ponds where suspended solids are trapped and dissolved organic materials broken down by biological action. After 3 years of research, development and pilot plant work, additional facilities now are being built and will provide treatment for that small quantity currently

J. B. Scott

bypassing the holding pond system. I might add parenthetically this system will be complete and in operation within the next 3 weeks. Total cost of all the wastewater control facilities we have constructed in recent years, over and above the control facilities installed as original equipment, will be close to \$500,000.

What have been the effects of these waste control efforts? Probably the most significant is that the BOD of our strongest effluent has been reduced to less than 20 mg/l. This has resulted in about 40 percent less BOD being discharged from Adams Terminal to the Ship Channel than is shown as currently allowed by the Texas Water Quality Board in Table VI-2-A of the Environmental Protection Agency's March 1971 report on pollution affecting shellfish harvesting in Galveston Bay. All this work has been undertaken with the knowledge and concurrence of both State and county enforcement agencies. It is certainly the intent of Phillips management and the employees of Adams Terminal to continue these efforts to fulfill both the spirit and the legal requirements of

P. E. Brubaker

environment protection. We appreciate this opportunity to express our views on this matter.

Thank you. (Applause.)

CHAIRMAN STEIN: Any comments? (No response.)

Thank you very much, sir.

MR. KECK: Our next speaker comes from one of the Texas City plants, the Monsanto Company Texas City Plant.

Mr. Phil E. Brubaker, General Superintendent, Plant Services.

MR. PHILLIP E. BRUBAKER

GENERAL SUPERINTENDENT, PLANT SERVICES

MONSANTO COMPANY, TEXAS CITY PLANT

TEXAS CITY, TEXAS

MR. BRUBAKER: Mr. Chairman, conferees and ladies and gentlemen. I am Phillip E. Brubaker, General Superintendent, Plant Services for Monsanto Company's plant at Texas City. I would like to request a revision of numbers in the EPA statement, report on current wastewater discharges at the plant, and tell you of our plans for the immediate future.

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P. E. Brubaker

As you glance down the industrial tables on Pages 58-62 of the report, the flow discharge of 106 MGD listed for our Texas City plant stands out like a sore thumb. We look like one of the major contributors of industrial waste in the entire Galveston Bay area. We note that the figures on our suspended solids, BOD and COD loadings are estimates, and these estimates led you to conclude that Monsanto contributes 96 percent of the solids and 83 percent of the COD in the Texas City-Dickinson Bayou area.

This estimate needs revision. Two of the figures are 10 to 15 times greater than our discharge. And the third figure is too low. (Laughter.)

While we do not know the basis of your estimates, it is obvious these figures do not consider the fact that 97 percent of the effluent consists of once-through salt water used for cooling. The vast majority of the 106,000,000 gallons we handle is not process wastewater.

Our current process wastewater discharge is 3 MGD. This represents about 15,000 pounds per day of suspended solids, not the 224,004 pounds reported. Our COD discharge is about 66,000 pounds, not the

P. E. Brubaker

569,589 pounds reported. Our BOD discharge, on the other hand, is 38,000 pounds per day, higher than the 8,397 pounds in the estimate.

Obviously, Monsanto's process wastewater discharge at Texas City is significantly lower than indicated. We do not contribute the high percent of the area's total discharge indicated on Page 69 of the report.

While Monsanto has carried out pollution control programs at Texas City since 1946, when we purchased the plant from the Federal Government, we recognize that the level of water quality must be further improved. Planning has been active for sometime. Our waste treatment picture has changed constantly in the last 4 years, primarily due to a massive construction program which replaced 80 percent of the old plant with new units and product lines.

Today we are carrying out a \$3.7 million program for additional wastewater treatment. Engineering design work began early in 1970 and construction will begin next month, July 1971. Part of the program

P. E. Brubaker

involves the recovery of aluminum chloride solution from a waste stream. Final phases of the program will include advanced methods of wastewater treatment.

Final details and timing of this program will comply with the updated discharge permit we are discussing with the Texas Water Quality Board. Completion of this latest project will give our plant BOD removal in excess of 90 percent.

I thank you for this opportunity to testify and set the record straight on Monsanto's role in the Texas City-Dickinson Bayou area. We are equally concerned with the present and future health of Galveston Bay and are working to maintain our corporate commitment to pollution abatement.

Thank you.

CHAIRMAN STEIN: Thank you. Just one moment, sir. (Applause.)

MR. VANDERHOOF: I have just one question.

Do you mix the effluents from your treatment plant in your cooling water prior to discharge?

MR. BRUBAKER: Yes, we do.

MR. VANDERHOOF: Then this perhaps accounts

P. E. Brubaker

for the difficulty of tracing the small concentrations in a large volume of water.

MR. BRUBAKER: I believe this is one of the problems, and we suspect that one of the problems with the COD analysis probably was an improper correction with the chloride content of that water.

MR. VANDERHOOF: All right. Thank you.

MR. YANTIS: On that COD analysis -- since Monsanto has 2 plants, I am not really sure which one I am talking about -- but there were some incorrect COD figures in the report, and they were taken from the Water Quality Board files. We happen to know, though, that the analysis was wrong. The laboratory was experimenting with the technique of simply trying to dilute away the chloride effect and run a COD without using mercury sulphate, or whatever is put in there to correct it. They found out it wouldn't work, and they went back to the correct method. However, there were some wrong figures in our files. I would simply point out that had anybody asked us, we would have told them that they were wrong.

MR. VANDERHOOF: You do have wrong figures

P. E. Brubaker

in your files?

MR. YANTIS: Yes. (Laughter.)

CHAIRMAN STEIN: We are going to get to this later. I think possibly this is a numbers game. I don't want to get into it now, but I think accurate figures, particularly in a plant such as Monsanto, can be gotten if you measured the concentrated waste stream before it is diluted.

Now what is why I asked. I know Mr. Jack Garrett has left, but I believe in other Monsanto plants in the country, we have never had any difficulty in exchanging information and getting accurate figures. I am sure we are going to do the same thing here.

Thank you.

MR. KECK: Our next speaker represents Crown Central Petroleum Corporation, Mr. Fred Otto, Vice-President--Refining.

Fred?

MR. FREDERICK M. OTTO

VICE-PRESIDENT--REFINING

CROWN CENTRAL PETROLEUM CORPORATION

BALTIMORE, MARYLAND

F. M. Otto

MR. OTTO: Thank you, Dave.

Chairman Stein, conferees, ladies and gentlemen. I am Frederick M. Otto, Vice-President-- Refining for Crown Central Petroleum Corporation, Baltimore, Maryland.

Crown Central Petroleum Corporation has a refining facility on the Houston Ship Channel, Pasadena, Texas, which can process 90,000 B/D of a sweet crude mixture. The refinery utilizes the following processing units: 1) crude distillation, 2) fluid catalytic cracking, 3) reforming, 4) alkylation, 5) delayed coking, and 6) solvent extraction.

The major portion of this refinery was placed in service toward the middle of 1970. Since many of these units were new to Crown, waste loads were not confirmed until operations were well established in the fall of 1970. During 1971, Crown samples indicate a total discharge of approximately 300 pounds per day of oil and grease, which is in compliance with our Texas Water Quality Board control order and well below the number of 1,200 pounds per day proposed on Page 70 of the EPA report.

F. M. Otto

In connection with the addition of the major new units, Crown contracted with a recognized wastewater treatment consulting engineering firm to establish the expanded refinery's future waste load based on national average refinery data. The purpose of this study was to put Crown in a position to act quickly in the design and construction of any additional treatment facilities. Unfortunately, this approach based on national average refinery data proved unreliable.

In May 1970, in cooperation with the Texas Water Quality Board and the Gulf Coast Waste Disposal Authority, Crown along with 4 other major industries began preliminary discussions with the Gulf Coast Waste Disposal Authority concerning the feasibility of a multi-industry treatment facility. Crown was one of the first of the industries to pledge its initial monetary support for the treatability study. This project was officially endorsed by formal amendment to Crown's Texas Water Quality Board's effluent control order.

In accordance with this order, Crown

F. M. Otto

recontracted for the services of a consulting engineering firm specializing in inplant studies of refinery waste streams. The purposes of this inplant study were to bring the quality of wastewater to the best operating level possible, to provide a basis for evaluation of the Gulf Coast Waste Disposal Authority proposals, and to provide if necessary the basis for the design and construction of an independent wastewater treatment facility. Phase I of the study began in November 1970. Recommendations therefrom resulted in modifications which significantly improved the refinery's wastewater quality. At the present time, we have received the Gulf Coast Waste Disposal Authority's report which contains treatability and feasibility findings; the next step is for all the involved industries to evaluate those findings.

Independently, Crown is engineering a new API separator, water handling facilities, and a stormwater reservoir. Whether Crown decides to utilize the Gulf Coast Waste Disposal Authority's treatment facilities or whether we determine to upgrade our own system, any improvement program is

F. M. Otto

estimated to be complete in late 1972 or early 1973.

From the facts as presented in this statement, Crown obviously feels it has a serious obligation to the community which we recognize and we plan to fulfill. (Applause.)

MR. VANDERHOOF: I have one question. You referred to a consulting engineering firm on Page 2, 3d paragraph. Would you identify them?

MR. OTTO: The one we work with now is presently Coke Chemical.

CHAIRMAN STEIN: I would like to commend you for your candor on this.

Since you are a Baltimore company, I won't ask you the hard question -- which you like better -- the ones up there or here. (Laughter.)

MR. OTTO: I live in Texas. (Laughter.)

CHAIRMAN STEIN: But I do have one. I want to bring out a point here. In your statement, in the thrust of your statement, I think it is rather important -- and I say this not in a sense of condemning anything because this is a relatively prevalent practice -- but you indicated that Crown put its refinery in

F. M. Otto

service in the middle of 1970, its waste loads were not confirmed until the fall of 1970, and that it won't complete its program until 1972 or 1973.

Now here is a relatively new installation where you put material in, and we are faced with the situation that we were faced with many years ago in which, after the installation goes in, we begin getting precise readings on the waste loads and what has been done, and we are getting that lag of 2 or 3 years before anything is done.

Industry has always said -- and I think this is the point -- that, with a new plant there is a notion that the waste problem is just as important as the production problem and should be thought out.

This is not directed necessarily at your company, sir, because that would be unfair, since this is so prevalent. But I am just taking this opportunity to point out why we very well may have this problem. We have talked to the industries many, many times. In this day and age -- when a new plant opens we expect that the waste problems will be as carefully thought out as any other production problem.

F. M. Otto

As someone in the paper industry has said, if we would just give as much time and effort to thinking about the waste problem as we do to the employees parking lot in the construction of a plant, we might be ahead. (Laughter.)

MR. OTTO: I would like to make one statement on this point, please.

CHAIRMAN STEIN: Yes.

MR. OTTO: In defense of Crown, obviously.

CHAIRMAN STEIN: Yes.

MR. OTTO: We were operating under the Texas Water Quality Board, and the plant was designed to meet this particular control order.

Shortly before the plant was put on stream, we were requested to improve the quality of our effluents, which we agreed to, and it was this program that I make reference to.

Also in that connection, at the request of the Texas Water Quality Board in asking for an improvement in our present permit, there were considerations given in the initial plant for wastewater control to the existing permit as it stood at that time.

Goodyear Tire and Rubber Company

MR. YANTIS: Murray, I agree fully with the remarks you made, and this has always been the way we have tried to operate.

CHAIRMAN STEIN: Yes.

MR. YANTIS: So, there is no argument there.

As Mr. Otto did say, this relates to a change which we thrust upon them shortly after they began operations. But they did have controls we considered to be proper at their original time. We just changed the signals.

CHAIRMAN STEIN: Like I say, Mr. Otto, we have made the same mistake, in my opinion, although Government like industry doesn't admit mistakes. When we have adopted approaches on national averages or state averages, they haven't worked either.

MR. OTTO: No.

CHAIRMAN STEIN: So we have gone down the same path, and I can sympathize with you in the problem you had.

Right? Thank you very much.

MR. KECK: The Goodyear Tire and Rubber Company has submitted a written statement for the record and they will not be presenting it.

[The above-mentioned statement follows.]

PRESENTATION

TO THE

U. S. ENVIRONMENTAL PROTECTION AGENCY

The Goodyear Tire & Rubber Company
Houston Chemical Plant
Houston, Texas

June 8, 1971

Policy Statement By Russell DeYoung

'We Give Top Priority To Environmental Control'

Mankind and his environment are the subject of national and worldwide concern. Despite all the vast resources and technology available today, the environment in which we live is deteriorating.

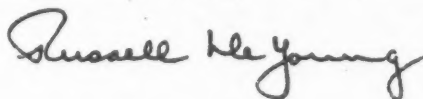
The problems of pollution know no boundaries, geographic or biologic. They affect us all, both as individuals and as members of society. And all of us, individually and collectively, must contribute to their solution.

Goodyear has deep concern for the well-being of its employees, its shareholders, its customers and the communities in which we operate.

For this reason and for the further reason that we recognize and accept the responsibilities of corporate citizenship, we assign the highest priority to the war on pollution and to the conservation of the world's total natural resources.

Such priority is not of recent creation. For the past five years the company has been moving forward at an accelerating rate to bring all our facilities up to high standards of environmental control. This program will be continued and expanded.

Goodyear is committed to devote whatever time, scientific talent, engineering skills and funds are necessary to establish the highest standards of environmental control in all of our own facilities and to foster such standards in the communities in which we live and work.



Chairman of the Board

INTRODUCTION

The Goodyear Chemical Plant is located eight miles from downtown Houston on Highway 225 leading to La Porte. Goodyear's Houston chemical complex is the largest synthetic rubber plant in the world. It was built in 1943 by the United States government to meet the desperate needs of the military and industry to supplant natural rubber during World War II. Twelve years later the government sold the plant to Goodyear. Since then its production capacity has expanded continuously.

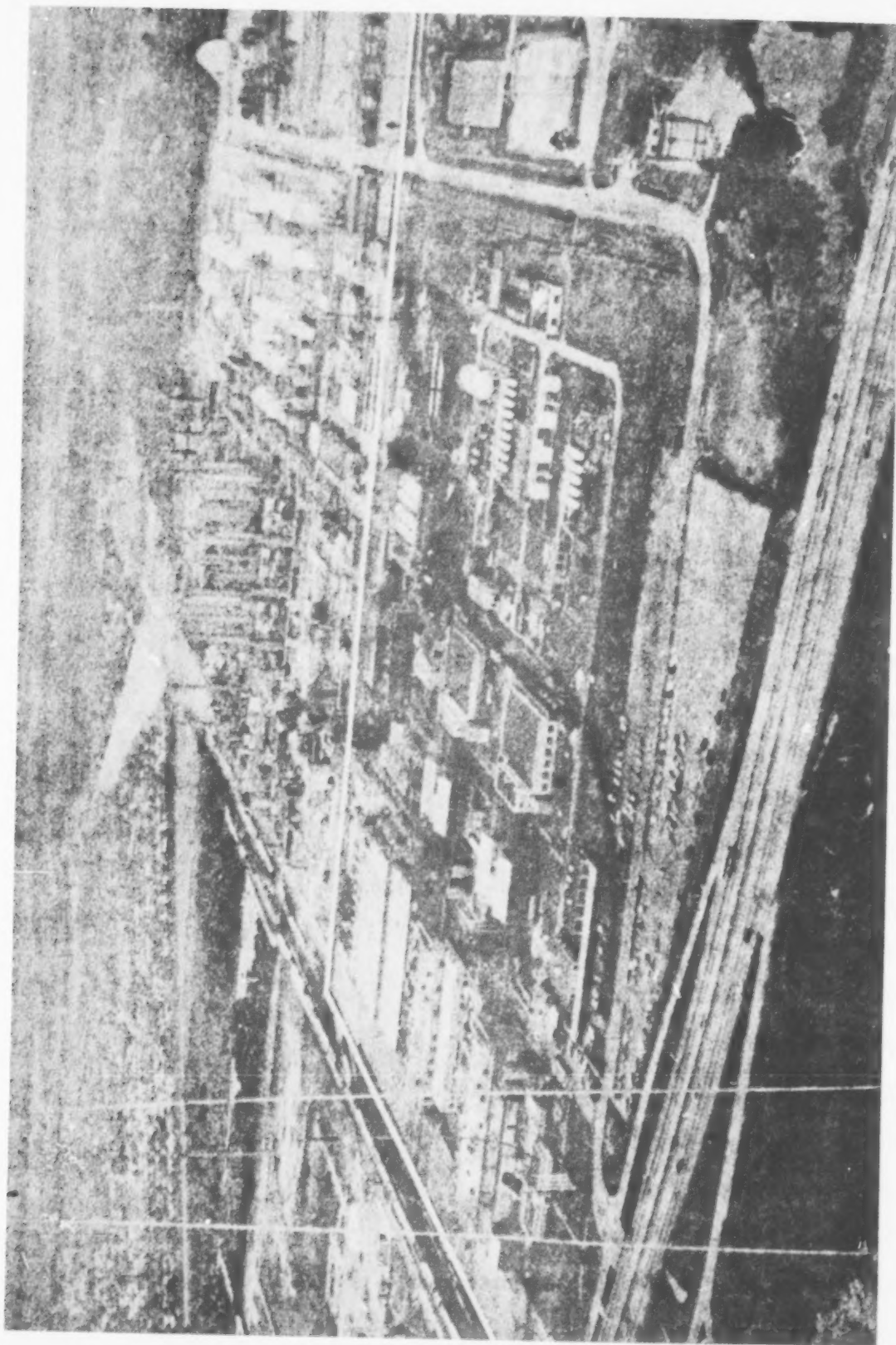
The primary reason for the expansion has been the world's growing dependency upon synthetic rubber - a tribute to the intensive research, development and production efforts of private enterprise and the rubber industry.

The bulk of production is styrene-butadiene rubber, nitrile rubber, and antioxidants. More than 700-million pounds of synthetic rubber is produced a year in the Houston plant.

Styrene-butadiene rubber, produced by Goodyear and other companies, accounts for approximately two-thirds of the synthetic and more than half of all the rubber used in the United States today, including natural rubber. Synthetic rubber totals about 74 per cent of the domestic rubber consumption.

The Houston plant employs about 800 Houstonians. It contributes to the Houston area's economy through the purchase of \$80-million worth of goods and services from 500 firms within a 50-mile radius of the city. The plant paid \$477,000 in local taxes last year.

We're proud of the record of our Houston plant. Houston has, in fact, become the synthetic rubber capital of the world.



The Goodyear Chemical Plant (foreground) as seen from the Goodyear blimp. The plant is located on Texas Highway 225, 8 miles east of downtown Houston. On the right can be seen the plant's water effluent treatment system.

TREATING SYSTEMS DEVELOPMENT

In March, 1969, Goodyear commissioned the Arthur G McKee Company, one of the nation's foremost engineering firms, to study the Houston plant's existing effluent system and to recommend changes for future needs. The final report recommended immediate construction of a biological waste water treating system. To date, two aerated lagoons have been constructed and placed on stream in March, 1970, and a third one went on stream in May, 1970.

In addition to the McKee study, an active development program was and is being carried on. On plantsite pilot testing and evaluation of several unit operations completed and presently under study are:

1. Flotation Pilot Plant manufactured by Permutit.
2. Filter indexing belt by Centri-Clare.
3. High pressure filter by Beloit-Passavant.
4. Centrifuges by Gilreath Hydraulics & Sharples.
5. Oil skimmer belt by Centri-Clare.
6. Vacuum filter by Dorr-Oliver.
7. Pressure filter - synthetic classified media.
8. Carbon absorption - activated black.
9. Low pressure filter.
10. Modification of existing primary clarifier.
11. Recycle and reuse of water.
12. Cooling tower treatment modification.
13. In-plant separation of process and rain water.
14. Feasibility study on the use of domestic sewage treatment plant effluent as a source of process water.

Treating Systems

To back up the Goodyear-Houston plant technical group, the consultant firm of Engineering-Science of Texas has been retained on a yearly basis.

To carry out the research and development work, a separate complete laboratory was designed and built with specialized instrumentation and test equipment under the supervision of an environmental engineer.

The importance of waste water quality control is also emphasized to plant personnel. Many of the management people have been sponsored by Goodyear for registered special courses in environmental sciences offered by local colleges and universities.

PRESENT WASTE WATER TREATMENT SYSTEM

The present system is a series of unit operation starting at the generating source:

1. Fines pits - solids/liquid separation by flotation and sedimentation.
2. Oil and heavy hydrocarbon separator pits.
3. Steam stripping to remove soluble organics - water and hydrocarbon recycled.
4. Collection system - trench and pipe - gravity and forced feed.
5. Primary clarifier
 - a. pH control automatic recording.
 - b. Chemical addition for flocculation and sedimentation.
 - c. Clarified water transferred to lagoons.
 - d. Sludge transferred for processing.
6. Biological treatment - aerobic digestion.
7. Sludge dewatering.
 - a. Concentration - chemical and physical conditioning.
 - b. High pressure filtration 250 psi.
 - c. Dewatered solids - land reclamation.
 - d. Filtrate recycle and return for biological treatment.
8. Final effluent aerated by a cascade and the volume recorded.
9. Discharged into Sims Bayou.

The effluent is monitored for quality by some continuous instrumentation and daily by the required wet chemistry techniques found in Standard Methods.

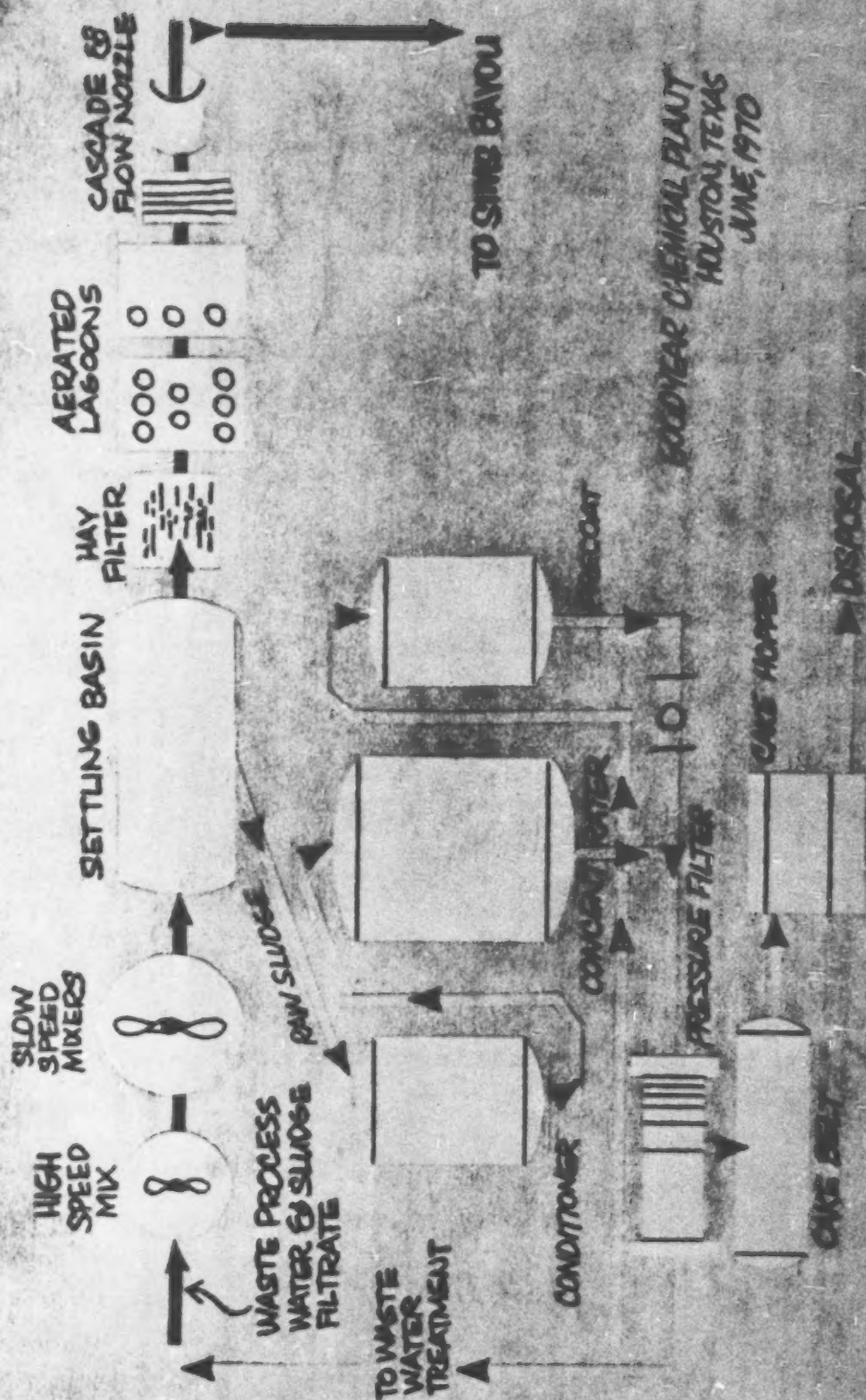
Much time, effort and money has been channeled into the improvement of The Goodyear Tire & Rubber Company-Houston Chemical Plant waste water quality. When development and research determine that additional treatment is necessary to improve the discharge quality the process is installed as soon as possible. This is reflected by the very recent completion and start-up of the high pressure filter for solids dewatering. This is the latest technology available in this field and The Goodyear Tire & Rubber Company-Houston Chemical Plant is the industrial leader in its application in the United States.

Present Treatment Systems

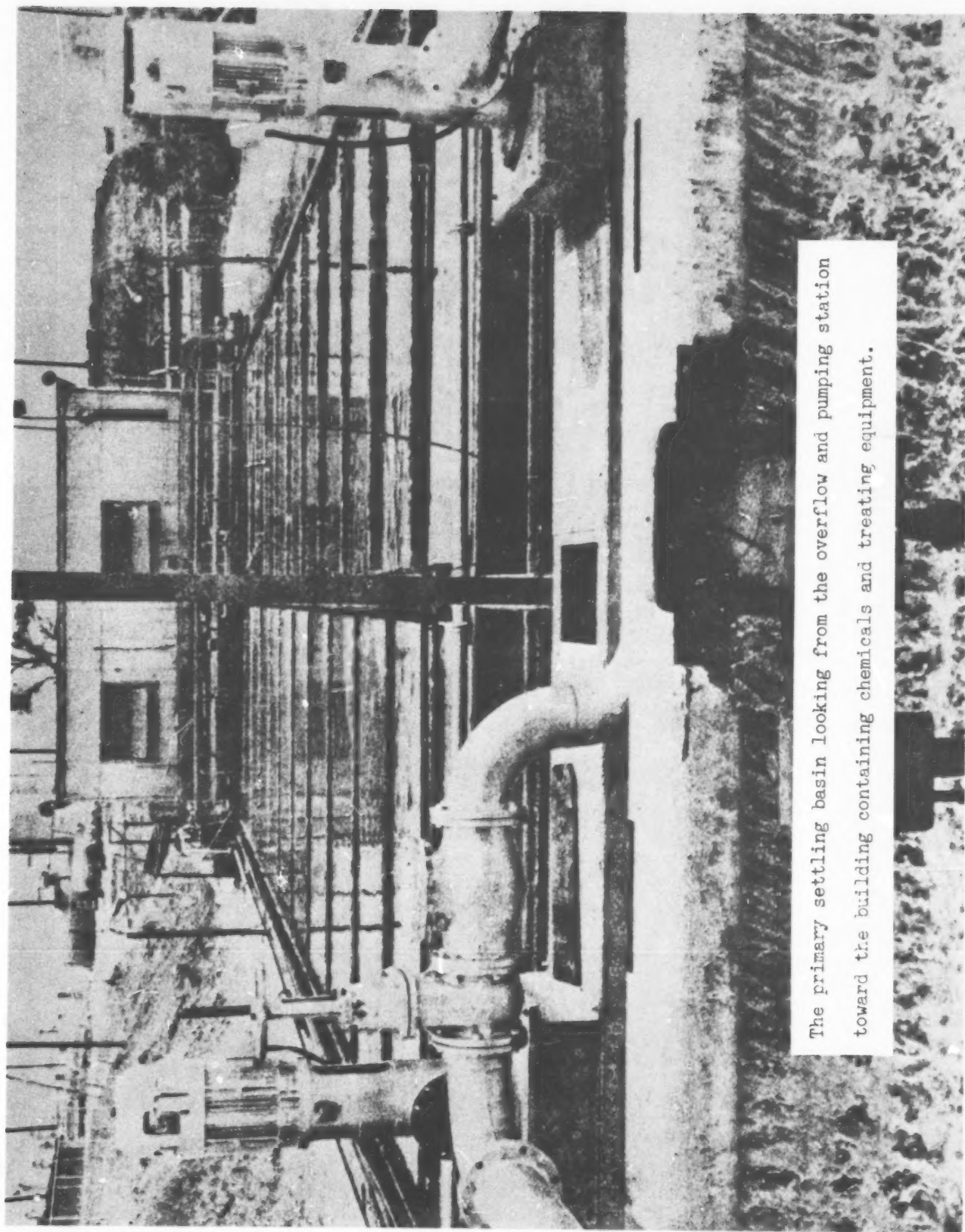
To investigate all avenues for the treatment of waste water, the Goodyear-Houston Chemical Plant joined the Gulf Coast Waste Disposal Authority in the development of the regional concept for waste water treatment. Time, personnel and money were channeled to the project.

It is the objective of the Goodyear-Houston Chemical Plant to carry out to the fullest extent the policy statement by Mr Russell DeYoung, Chairman of the Board.

EXPANDED EFFLUENT TREATMENT SYSTEM



FOODYER CHEMICAL PLANT
HOUSTON, TEXAS
JUNE, 1970



The primary settling basin looking from the overflow and pumping station toward the building containing chemicals and treating equipment.

COST SUMMARY FROM JAN., 1969
(EXCLUDES OPERATING COSTS)

ITEM	SPENT OR COMMITTED
CONSULTING & ENGINEERING	\$ 60,000
PLANT SEPARATOR	18,000
IN-PLANT CONVEYANCE	80,000
PROCESS WATER PURIFICATION	184,000
EXISTING LAGOONS (AERATORS, ETC.)	125,000
LAB MODERNIZATION	20,000
DO & TOD ANALYZERS	13,000
SLUDGE DRYING	225,000
SETTLING BASIN	75,000
	\$800,000

A SUMMARY OF LABORATORY EXPERIMENTS
RELATING TO THE BIOLOGICAL TREATABILITY
OF GOODYEAR'S EFFLUENT

by

Davis L. Ford, Ph.D., P.E., Manager

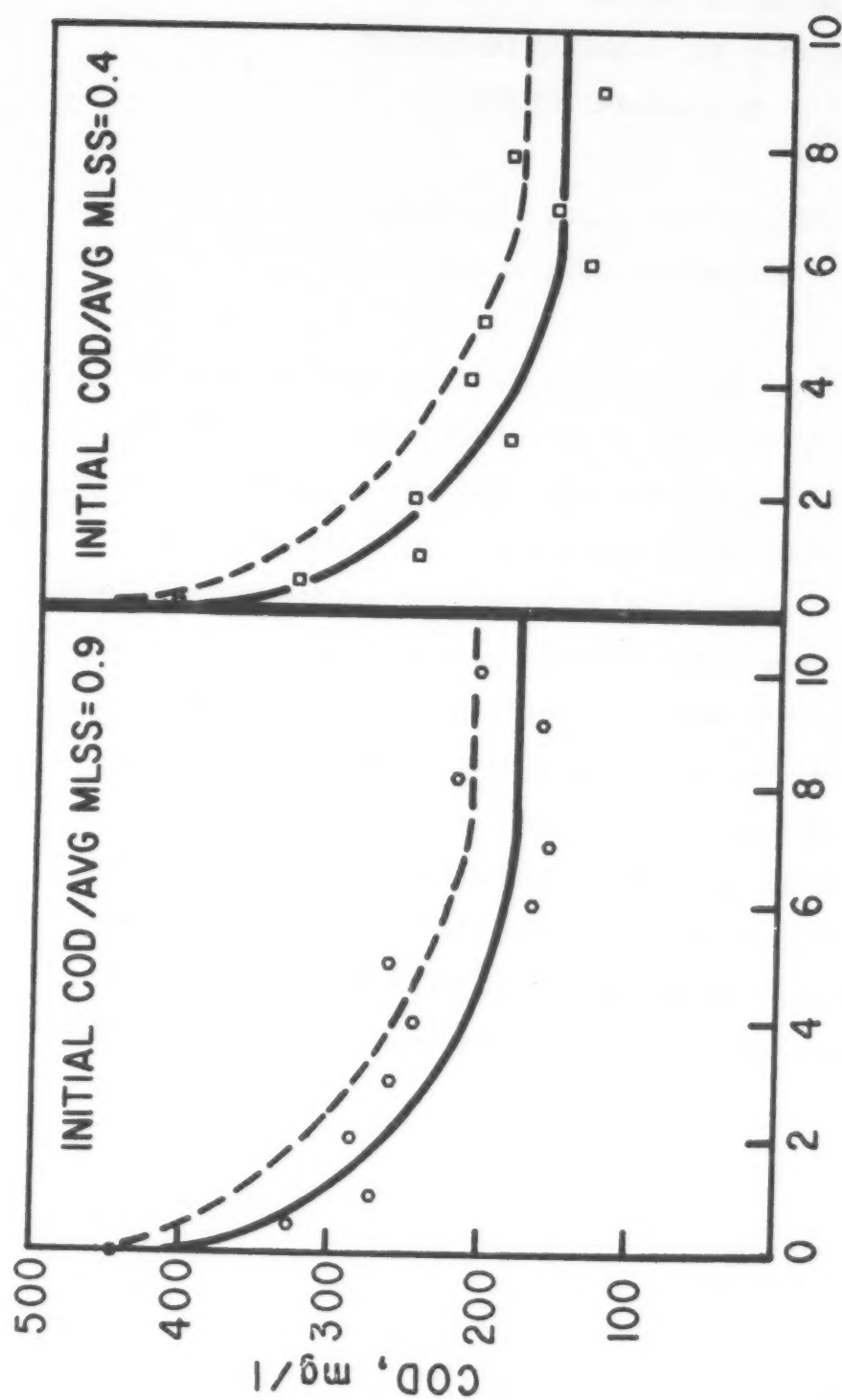
Engineering-Science of Texas

This will summarize the laboratory activities conducted by Goodyear personnel relative to the degree of biological treatment obtained using present representative waste water being discharged by Goodyear.

A series of batch reactors were set up in the laboratory using a fluidized mixture of an acclimated biological seed and Goodyear waste water, this mixture being aerated for predefined periods of time. The mode of the test was designed to simulate the prototype biological system.

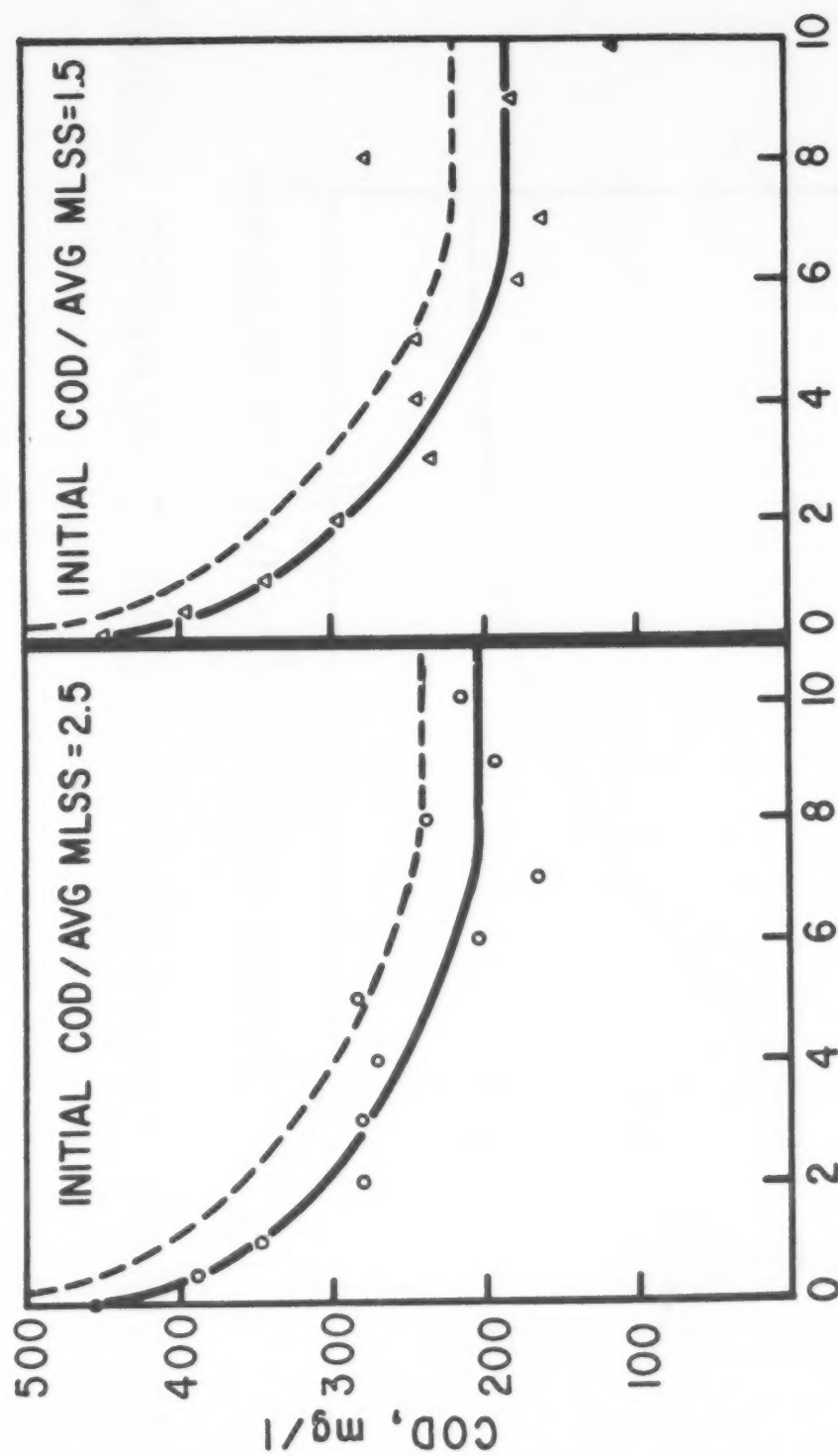
It was observed from these tests that the waste water is amenable to biological treatment with the treated effluent having a residual C.O.D. ranging from 250 to 350 mg/l. It is concluded from these tests that the organic residual in terms of C.O.D., using the best biological treatment methods available under current technology, will fall within this range.

The following graphs illustrate the results of the tests conducted.



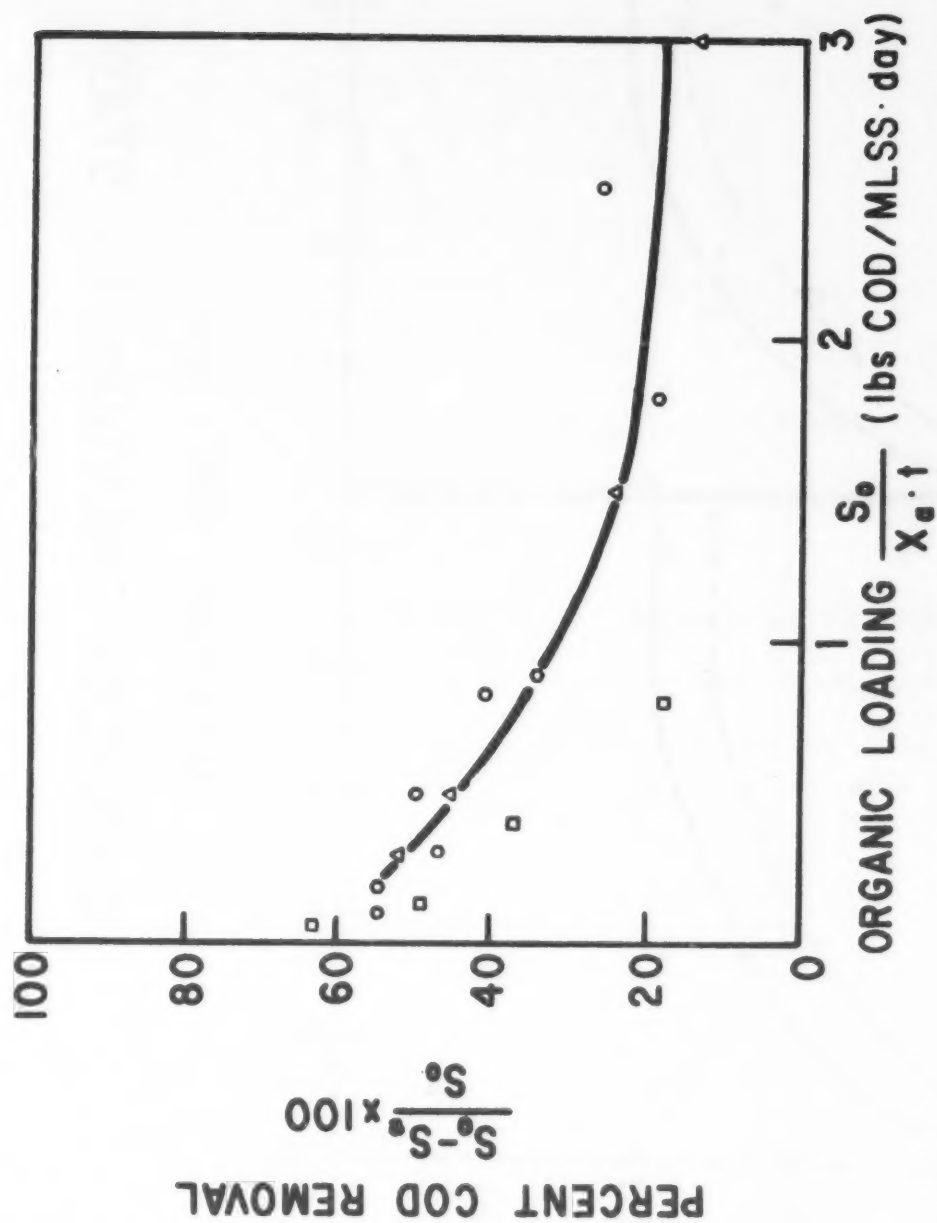
AERATION TIME, days

GOODYEAR TREATABILITY STUDY



AERATION TIME, days

GOODYEAR TREATABILITY STUDY



GOODYEAR TREATABILITY RESULTS - AERATED LAGOON

Channel Industries Oil Control Coordination Committee
(read by David R. Keck)

MR. KECK: Pursuant to the discussion a few minutes ago about the control of oil spills, there was concluded last Friday, I am told, an agreement among six oil companies to form an organization to control oil spills. I would like to read an announcement of this organization.

[The above-mentioned announcement follows.]

STATEMENT TO BE MADE AT THE
ENVIRONMENTAL PROTECTION AGENCY HEARING
ON JUNE 7, 8, AND 9 OF 1971 AT THE
RICE HOTEL - CRYSTAL BALLROOM
HOUSTON, TEXAS

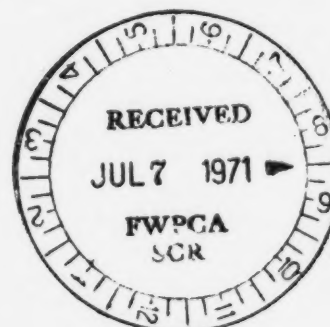
Chairman Stein, Ladies and Gentlemen:

The Channel Industries Oil Control Coordination Committee is a non-profit cooperative organization which renders mutual assistance in controlling oil spill emergencies occurring on the Houston Ship Channel from the Turning Basin to the Baytown - LaPorte Tunnel.

Members of the committee are:

Atlantic Richfield Company
Charter International Oil Company
Crown Central Petroleum Corporation
Humble Oil and Refining Company
Shell Oil Company
Texaco Incorporated

Atlantic Richfield Company is Chairman. Shell Oil Company is Vice-Chairman. Rules and Procedures of the committee are based upon the widely used form recommended by The American Petroleum Institute. Work by the committee is coordinated with appropriate State and Federal agencies and should result in significant progress in controlling oil spill emergencies which may occur on the Houston Ship Channel.



D. R. Keck

MR. KECK: So, I think the oil companies are taking some steps beyond those measures they take within the refineries to control oil spills within the Houston Ship Channel.

I understand that there is another organization which already exists which covers Galveston Bay. So, we should have the whole water area around here covered with private oil spill protection efforts.

Is Mr. Kirk Strawn back?

DR. STRAWN: Not ready yet.

MR. KECK: All right.

In that case, that concludes the industrial presentations for this morning.

(Applause.)

MR. YANTIS: The Chairman and I are discussing adjourning for lunch.

Let's take a look at what we have left now.

A number of industries have spoken today and yesterday, and I am fully aware that citizens groups and others have been most patient and had hoped, actually, to be able to speak yesterday. All the

D. R. Keck

industries that have spoken up to this point are those which we asked the Houston Chamber of Commerce to get together to make a presentation.

There are, however, 1 -- 2 -- 3 -- 4 -- 5 more industries in a slightly different category who have relatively short presentations. These industries which have not yet spoken were mentioned in the report by name. We invited them to come to the hearing and speak on whatever they wished because they were actually named in the report, not merely listed in a table. At least 1, maybe 2, of the industries have already spoken in the first group. But all of these parties were invited by the Water Quality Board because of the fact that they were named.

Now they would expect to have, I hope, not more than an hour and a half. It could turn out more. But I might estimate at the moment that the general public could probably be able to speak around 3 o'clock.

We have other governmental entities yet to be heard before the public; Harris County Health Department, Dr. Walter Quebedeaux, has asked to make

D. R. Keck

a presentation; a representative of Senator Schwartz has asked to make a presentation. Whether you call the Senator a "representative of the general public" or not, I will leave that to the "general public."
(Laughter.)

MR. YANTIS: But because we will be adjourning a little bit early -- 5 minutes -- if Mr. Stein concurs, I would like to reconvene not later than 1:30.

CHAIRMAN STEIN: Yes.

MR. YANTIS: Then I think that we can get in a pretty good afternoon's work.

Then, we are adjourned, Mr. Chairman.

CHAIRMAN STEIN: Yes, we are adjourned.

(The conference recessed until 1:30 p.m.)

AFTERNOON SESSION

Dr. K. Strawn

CHAIRMAN STEIN: Let's try to get started,
Mr. Yantis.

MR. YANTIS: Dr. Kirk Strawn will read his
brief statement which we did not get to yesterday,
and then we will go into the remaining group of
industries.

DR. KIRK STRAWN, PROFESSOR
DEPARTMENT OF WILDLIFE AND FISHERIES SCIENCES
TEXAS A & M UNIVERSITY
COLLEGE STATION, TEXAS

DR. STRAWN: I am Dr. Strawn.

Graduate students working under the
direction of me and my colleagues have been performing
research at powerplants for several years on Galveston
Bay. We started work at the P. H. Robinson plant at
Bacliff in 1967 and the Cedar Bayou plant in 1969.
We have collected a set pattern of stations regularly
to determine occurrence and relative abundance of
organisms in regard to powerplant activities.

Based on water conservation concepts, it.

Dr. K. Strawn

is better to have a powerplant use marine water than freshwater for cooling. We will need the freshwater for human requirements such as drinking water and the growing of crops, needs for which sea water is unsatisfactory. A cooling tower using sea water puts too much salt into the air, and for the present technology a cooling tower using freshwater consumes more water than a cooling pond.

Scattered powerplants on Galveston Bay add diversity to the environment and provide organisms with a choice of environment not normally available. At the Robinson plant discharge, only the most heat-resistant organisms such as young blue crabs use the area between the groins in the hot part of the summer -- at this time the young blue crabs occur in great numbers. As the water cools in the early fall, white shrimp concentrate in stillwater areas between the groins. During the cool months the discharge temperatures are more favorable than the Galveston Bay temperatures and organisms make full use of the area between the groins. Striped mullet in good condition concentrate there in great numbers.

Dr. K. Strawn

The evaluation of a powerplant discharge, as indicated above, has to be in terms of an annual cycle. My opinion is that the P. H. Robinson discharge into Galveston Bay either does as much or more good than harm during the annual cycle and that it will prove highly beneficial by saving fish from cold death during the cold kills that occur about once every 10 years on the Texas coast.

The Cedar Bayou plant will pump water from Cedar Bayou and Tabbs Bay into Trinity Bay. The effects of this water in Trinity Bay probably will depend on how well chemical pollution is controlled in areas upstream from the plant. The proposed cooling pond will keep temperatures of water entering Trinity Bay lower than levels that now appear acceptable at the P. H. Robinson discharge.

I have some data here on before and after collections made at the Cedar Bayou plant by Mr. Kenneth Johnson, one of my graduate students that is working on fish distribution there.

Before the operation of the plant: 210 collections were made between November 11, 1969 and

Dr. K. Strawn

March 8, 1970.

After operation of plant: 232 collections were made between November 19, 1970 and March 9, 1971.

Since there were more collections made afterwards -- about 10 percent -- you ought to produce about 10 percent more, you ought to reduce about 10 percent on the numbers I will give you as those after.

Number of Species, 35 before and 43 after would be --

MR. YANTIS: Dr. Strawn, I wonder now that we have the report and preliminary work, do we need to read all the tables?

DR. STRAWN: This first little table, I think, would be good. The others I don't intend to read.

MR. YANTIS: All right.

DR. STRAWN: Now, Total Fish, 15,501 before. After, 60,825. Now I will give you the individual species. Atlantic Croakers -- just plain croakers in the Galveston Bay area, but that is the common name the American Fisheries Society gave the

Dr. K. Strawn

croaker -- 4,939 before, and, 28,445 after. Anchovies -- that is the little bay anchovy -- 6,357 before, and 22,673 after. Menhaden, 1,738 before, and 4,201 after. Spot, 281 before, and 983 after.

Thank you.

CHAIRMAN STEIN: For the record, Dr. Strawn, I know you have graduate students working under you.

Do you care to reveal, for the purpose of the record, what institution you are connected with?

DR. STRAWN: Oh, excuse me. Texas A & M.

CHAIRMAN STEIN: Thank you.

DR. STRAWN: Ph.D., level students.

CHAIRMAN STEIN: Yes, yes, yes. It wasn't mentioned.

MR. VANDERHOOF: I have a few questions, sir.

Are you familiar with the Texas Water Quality Standards?

DR. STRAWN: Not thoroughly.

MR. VANDERHOOF: Are you familiar with the water quality standards in the vicinity of the Robinson plant?

DR. STRAWN: Well, I presume that they are the rise that you all have in the black book there.

Dr. K. Strawn

Let's see. What is it, 1.5 in the summer and, what is it, 4 in the winter?

MR. VANDERHOOF: Do you know whether or not the water quality standards are being met in that area?

DR. STRAWN: I would say that the water quality standards are not right for Texas.

CHAIRMAN STEIN: Well, who sets up those water quality standards?

DR. STRAWN: How many Southerners did you have on that committee?

MR. YANTIS: Now, Mr. Stein, if we are going to begin again the debate that we had for 2 hours yesterday, we will do nothing else for the rest of the week.

I think it would be far better if we put the tables into the record and let the conferees, any way they wish to, evaluate them any way they want.

CHAIRMAN STEIN: I don't think we are going to cut off questions.

MR. YANTIS: We will be here for a month.

CHAIRMAN STEIN: Well, if it takes a month,

Dr. K. Strawn

we will be here all summer if it takes that, and I hate to quote the guy who said that down here. (Laughter.)

CHAIRMAN STEIN: But I believe it has to be pointed out that the standards were set by Texas and sent up to the Federal Government and approved by them. And if they are not right for Texas, these are standards which were promulgated by Texas.

DR. STRAWN: We have in Texas mostly eurythermal fish, where in a lot of areas the fish are stenothermal.

Now, as far as water quality standards, I think this would be in terms of your mixing zone, and on this I am not clear.

MR. VANDERHOOF: Mr. Stein, I do have a lot more questions, but I think the answers are all summed up very nicely in his last response to my question. I think the attitude is quite important.

CHAIRMAN STEIN: Do you have any more questions?

MR. VANDERHOOF: I have plenty more questions.

CHAIRMAN STEIN: Do you want to ask them now?

MR. VANDERHOOF: No.

CHAIRMAN STEIN: Thank you. All right.

Let's go on.

MR. YANTIS: How many of you would like to explore for a month in detail any question that could be raised. (No response.)

I don't think anyone here would. So, the fact that I will refrain does not mean that I always agree or have nothing to say. I think we have to be practical in the length of time that can be devoted.

In the black paper, some industries were named by name in the narrative part of the report -- I mean, not just in tables. They were invited to be present and make whatever statements they wished. I hope that the statements will be brief.

But this group is not a part of the Houston Chamber of Commerce presentation as I have them listed, and remember, some of them have already spoken. They are Ethyl, Rohm and Haas, Arco Chemical, Monsanto in Chocolate Bayou, and Gulf Sulphur. Probably Texas Gulf Sulphur. In the order listed, and as each speaker begins, I would like an estimate of the time that you think it will take because there are

a good many people here from the ordinary public who are just itching to talk, and the longer anyone else talks, the longer they have to wait. So, is there anyone here from the Ethyl Corporation? (No response.)

I had understood that there would be a representative here. Do you know, Mr. Teller?

MR. TELLER: No.

MR. YANTIS: All right, is there anyone here from Rohm and Haas?

DR. MAX SMITH: We don't wish to make a statement.

MR. STEIN: By the way, please identify yourself for the purpose of the record.

DR. SMITH: My name is Max Smith. I am an environmental engineer and I work for Rohm and Haas.

MR. YANTIS: Dr. Max Smith.

Is there anyone here from Arco Chemical Company?

MR. DAVIS: Yes. I am Herman Davis from Arco Chemical, and we don't plan to make a statement.

MR. YANTIS: Is there anyone here from Monsanto's Chocolate Bayou plant?

MR. DAVENPORT: I am Gordon Davenport, and we have not made a request to talk.

MR. YANTIS: All right. Is there anyone here from what is called Gulf Sulphur, probably the Texas Gulf Sulphur Company. (No response.)

MR. YANTIS: All right. Now this, then, is all of the major companies, if I can read my writing.

Emery Waite, the same man that is going to have the shrimp party, had asked to speak as soon as the major industries got through. I think that he has probably changed his plans, but I don't know. Is Emery Waite here? (No response.)

MR. YANTIS: I think at this time Emery Waite, from Emmett's Sea Food Company, can stand on the State Health Department's statement.

You might as well come on now (indicating). I have forgotten your name.

Except for Dr. Quebedeaux who says he needs 3 hours, this is all.

MR. DOERR: I didn't get that. What did you say?

MR. YANTIS: No, not you.

Walter Quebedeaux on behalf of Harris County, wants approximately 3 hours. I think as a

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courtesy to some of the citizens who are here and some of the other organizations who have free statements, we ought to get some of those on first.

MR. STEIN: I think Dr. Quebedeaux might want to start tomorrow morning and let the other people go this afternoon.

MR. FRANK DOERR, CHAIRMAN
POLITICAL ACTION COMMITTEE, HOUSTON SPORTSMAN'S CLUB
HOUSTON, TEXAS

MR. DOERR: Honorable Chairman, distinguished members of the Board, fellow concerned citizens of the State of Texas. The sometimes misquoted, sometimes underestimated fourth estate --

MR. YANTIS: Please introduce yourself.

MR. DOERR: My name is Frank Doerr. I am Chairman of the Political Action Committee of the Houston Sportsman's Club with its 5,000 members and its 115,000 affiliated voices in the coastal areas of the Gulf Coast area.

Hundreds of water pollution studies have been made to determine causes of water pollution in our rural and urban environment. Studies were instituted to seek methods for identifying the sources of water pollution.

In the urban areas, it was discovered that

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street refuse, otherwise known to us as litter, was a significant factor of pollution under shock or abnormal discharges. Evaluation of street cleaning equipment and its uses pinpointed an inefficient operation. It has also been discovered catch basins release large quantities of septic liquid during periods of stormwater runoff. The public works engineers are still designing outmoded stormwater runoff systems which will not reduce nor retain water pollution at its source.

Other potential sources of water pollution should be considered. The sources to be considered are air pollution, grease discharges and chemicals. Let us first examine the actual environment and determine what is a tolerable level of pollution.

Air contaminants consist in the form of particulates otherwise known as aerosols and gases. A substantial amount of air pollution is of natural origin. Some natural pollutants can be identified as withering dust storms, forest fires, volcanic eruptions and erosion. Most of these natural environmental occurrences are uncontrolled.

The total amount of particulate transposed to the various natural causes amount to approximately

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60 tons per year per square mile of area. Compare this, if you will, to 900 tons per square mile per year in heavy industrialized areas.

A water shed area of 900 square miles will deposit 810,000 tons of pollution at its point of discharge. This can be into a bay, lake, gulf, or the sea.

This 900 tons of pollution obtained from each square mile of our environment is what we responsible citizens of this country want controlled. To thoroughly understand what this 900 tons consists of, we must examine each pollutant at its source.

Contamination of land runoff in rural and semi-rural regions results from solution and physical entrainment of land organics, animal waste, fertilizers, fungicides, herbicides, algacides, rodenticides, pesticides -- and I might add here, recently the Texas Parks and Wildlife System said "pesticides" is a very misleading word. It should be put into a different nomenclature as biocide -- that which kills. Another chemical. Contamination of

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land runoff in urban areas result from street litter, airborne debris, discharge from cooling and refrigeration systems, contaminated water from back-washing operations, commercial and industrial establishments, illegal dumping of actual wastes and sanitary effluents into separate storm sewers, and illegal discharges of individual septic tanks into storm sewers systems.

Each of the contaminants discussed here comes under the control of an agency at the Federal, State, county or city level. Each agency should review its legal responsibilities and act sanely and forthright in discharging its duties to reduce contamination in its sphere to the public trust.

We as concerned citizens should correlate the nature of pollutants to all government officials. We should inform the general public of its responsibilities for making the environment a better and cleaner place to live and work. We should assist all agencies in providing guidelines for the practice of preventive and collective measures that can stand the test of practical workability and economic feasibility.

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To enlighten you as to status of municipal waste treatment facilities in Texas, 23 percent of the state population live with no waste treatment facilities. With modern package treatment plants available, there is absolutely no excuse for this.

Industrial plants discharge 31.7 billion gallons of effluents into the public sewers of Texas. In 1973, the rate of discharge will be 51.7 billion gallons for an increase of 63.1 percent.

The factors of particulate and thermal pollution will necessitate close surveillance and monitoring by the people of all industrial wastewaters. Pretreatment of industrial waste will be necessary in some industry. It is apparent that industrial wastes are a much larger potential source of water pollution than are the waste of the Nation's municipal pollutants. Estimated production of standard BOD by industry is almost 3 times that of municipalities. Production of suspended solids is between 2 and 3 times of that of municipalities. In addition, polluting increases in temperature, alkalinity, acids, color, metals and toxics in our Nation's waters, as the result of the

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waste of industrial processes, are significant and growing.

Our policy for the abatement of water pollution is this:

Number one: that designers, manufacturers, and the water pollution control authorities develop new methods for the treatment of polluted water.

Number two: that community officials be made more aware of the importance of the pollution problem and overcome their inertia to corrective actions.

Number three: let improved record systems be developed and utilized by pollution agencies for the management of wastewater collection and treatment facilities and the results publicly disclosed monthly.

Number four: that the professional elite, those mandarins who hide behind their Chinese walls of state regulations -- these mandarins who pay lip service to their code of ethics to obtain their thirty pieces of silver -- these men should be removed from all participation in the development of policy for the preservation of our environment.

Thank you very much, gentlemen. (Applause.)

MR. YANTIS: Thank you, Dr. Doerr. Now

Dr. A. Busch

Professor Art Busch. Are you here?

Please remember -- I have already heard from Art how long he wants, which is relatively short -- as each speaker comes up, please give an estimate of your time so that I can figure out the rest of the agenda.

DR. ART BUSCH

PROFESSOR, ENVIRONMENTAL ENGINEERING

RICE UNIVERSITY

HOUSTON, TEXAS

DR. BUSCH: I estimate about 3 minutes

I am Art Busch. I am appearing for myself in regard to professional activities in environmental pollution.

Mr. Chairman and gentlemen of the staff, ladies and gentlemen. Much has been said here about the differences of opinion between EPA and the Texas Water Quality Board. These differences basically concern, it seems to me, how bad conditions are in Galveston Bay and the Ship Channel. But my comments relate to matters of policy supported by both EPA and

Dr. A. Busch

the Texas Water Quality Board. I think these policies are especially pertinent because I believe that these policies are primarily responsible for prior, and to some extent, for continuing pollution of this area.

The policies I refer to are two. The first is support of the Galveston Bay Study; then the second is support of regional treatment systems for industrial waste treatments, particularly when these central regional treatment facilities are owned and operated by public agencies such as the Gulf Coast Waste Disposal Authority.

Now the concept of a long term multimillion dollar study to establish how much pollution can intentionally be discharged I don't believe can be any longer tolerated. The Galveston Bay Study has grown in scope and in cost far beyond its original projections, and yet both the EPA and the Texas Water Quality Board continue to finance its support. But I think the basic question is that if the project study is achieving its objective after 4 years and about \$4 million, why are there any controversies over conditions in the water?

Another important point is that some

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industries, a few, have chosen to use the existence of the Galveston Bay Study as a basis for delay in taking action on pollution abatement on the superficially logical ground that until the study is completed, industry can't intelligently plan its treatment action. The industries -- more of them -- that have gone ahead with pollution abatement are now under strong pressure, which is good, to meet all aspects, all specifications of their waste control order, while some of their neighboring plants may have yet to take any action at all.

Gentlemen, I think one fact is obvious -- pollution abatement must be based on mutual good faith and equity. To pressure one industry having built its own treatment system to do better and to allow another to obtain immunity from action by participation in feasibility studies by the Gulf Coast Waste Authority, I don't believe is equitable. Nor is it equitable to build publicly-owned treatment facilities for industrial waste to relieve them of responsibility. Now, according to the newsletter of one of our large nearby corporations, a treatment

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system not meeting effluent standards for Galveston Bay has been accepted by the Gulf Coast Waste Disposal Authority for public ownership and operation. This means to me that a public agency is knowingly building a treatment system which will not meet effluent criteria already established. This taxpayer-owned system, according to the company's own newsletter, will discharge right at 17,000 pounds of BOD per day in a flow of over 13 million gallons of wastewater. This works out to a concentration of 150 mg/l or ppm of BOD, which is equivalent to untreated wastewater.

Gentlemen, I suggest the following of what I consider to be positive action steps. The first is to stop the Galveston Bay Study and use the money for pollution abatement instead of this. The second is make each industry responsible for its own waste treatment operations in individual or privately-owned systems. The third is stop allowing industry to buy immunity from pollution abatement action by participation in publicly-supported studies. The fourth is require publicly-owned facilities to meet standards.

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And the fifth is to apply cleanup pressures equitably by not nit-picking until all industries have at least begun action.

Thank you very much. (Applause.)

MR. STEIN: Thank you, Dr. Busch. Dr. Busch, any study we participate in, and I suspect any the State of Texas participates in, is predicted on the notion they won't be used as a delay for abatement.

I have heard from various industries for the past 2 days. None of them have indicated they wanted to delay their abatement program until any study was completed. Do you have any specific industries you want to name, because I heard from these industries, and they didn't seem to indicate that that was their policy?

DR. BUSCH: Well, I didn't hear all of the industries that testified. I did hear some of the names called a few moments ago by Mr. Yantis, and I don't see any point in my naming them. The idea is not to publicly indict people but to call for some broad action program other than more feasibility studies.

MR. STEIN: Sir, I dislike using an analogy,

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but years ago someone told me, "If you are going to shoot geese and you just sight at a flock of geese, you aren't going to hit any. While they may have looked like a flock when you shot up there, there were big spaces in between." (Laughter.)

Now I think the purpose of this conference is to get down to specifics, name names in particular and so forth. I can appreciate your general view, but unless we have specifics we are going to have a very hard time zeroing in on a pollutor.

DR. BUSCH: Well, it becomes a matter of semantics, if you wish, but anybody by definition -- anybody that is supporting the feasibility studies of a Gulf Coast Waste Authority -- if this is considered to be action, then I am not privy to the most recent activities of the industry. I don't believe it is appropriate. Maybe they all have moved by now. In recent months, from what I can see, some of them haven't moved.

MR. STEIN: I have no further questions.

MR. YANTIS: Professor Busch, because of the position you hold and the public office which

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you once sought --

MR. RICHARDS: That is "horse-shit."

MR. YANTIS: -- and may seek again, anything you say is listened to by the public with great care. I think that gives you a responsibility which perhaps others don't have to as great a degree.

I do, however, think that some of the things you have said are erroneous. Now, I asked you on the program today knowing that the Gulf Coast Waste Disposal Authority could not be here until tomorrow. This, in effect, separates by a day their ability to respond in whatever way they wish to respond.

I think we have already recognized that there are different views. I know that you and I have different views. You can only ride one horse at a time, and we have picked the horses that we are going to ride, but tomorrow, if you choose, you will hear a different view from the Gulf Coast Waste Disposal Authority.

In the meantime, I would like to invite your passionate young student to take the rostrum and let's hear what he said.

Dr. A. Busch

MR. RICHARDS: There will be time for that tomorrow at HEP.

MR. YANTIS: I would like to have you do it now.

MR. RICHARDS: I would like to apologize for my remark.

MR. STEIN: By the way, the difficulty is that we can't have the records showing anonymous voices from the audience. Would you give your name, please?

MR. RICHARDS: Ed Richards. I would like to go on record as apologizing for the remark.

DR. BUSCH: I will have to say Mr. Richards is representing HEP and not me.

MR. RICHARDS: Right.

MR. YANTIS: I have children, and I have grandchildren, and they passionately believe in certain things. Sometimes these are things I don't believe in. But they are going to be here a long time after I have gone, and I believe what they think and what they want to say and what they wish to do in the world they live in is important, though their life style in many cases

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differs from ours. I do not wish to brush them off. I do not always understand them, and they don't always understand me. But at least for several generations, there is room for all of us.

I have known Professor Busch for something like 12 years, and I suppose sometimes during that 12 years we have agreed on some things. I agree he is a damn good engineer. I agree he has a lot of very fine qualities. But when it comes to how things ought to be administered, we come out with different answers. Our society is geared to make decisions with people who have different views. That is fine. He has one view about how we ought to solve it, and we have some different views how we ought to solve it. But we can only do it one way at a time.

If you have any concluding remarks, please feel free.

DR. BUSCH: Thank you.

The point about regional treatment systems that I make is very simple. The problem is tough enough within a given industry to come up with an effective viable least-cost-treatment system, and the only leverage you have to minimize or abate pollution

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is within the operation itself. Now, regional systems complicate the problem by making the mixture more difficult, and they also remove the leverage which you have for the individual manufacturing unit to be responsible for its own waste production.

It is a very simple concept. If we are going to design a process we have to know as much as possible about the feed stock. And the further the feed stock goes before it is treated, and the more it is messed with, the more difficult the problem is. I believe that anybody who produces a waste should be responsible for its cleanup or its elimination.

MR. STEIN: Professor Busch, you know I too respect your views. But let me indicate that I think the view you are taking probably is against the general trend we are having in the country today. That is not to say I don't respect what you are saying.

But, let me point out that when industries go into large municipalities like St. Louis, Chicago, and New York, the city is responsible for the waste and the industry isn't. Many of the States, and the Federal Government, in large measure, are sponsoring

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these regional systems for one reason. That is the wastes, as we have heard in the past few days, have gotten so complex that in attempting to have individual plants, or even individual communities treat the waste, we can't always provide the laboratory backup or the kind of highly professional staff that is necessary to meet the problems. The notion is, if you can get them in a regional system, you can provide the laboratory backup, the sophisticated equipment, and a staff.

Now, theoretically I am with you. In any specific situation, in other words, if you have any specifics that we have to deal with in which you believe that this would not work, I think we would have to talk in terms of the specifics.

I think you brought up such a fundamental question. I want to speak for the Federal Government and not for the State of Texas. They may have the same views. For example, we heard from General Hatch. Now, based on my experience as a regulatory official, and all other things being equal, if he can handle the waste I would rather deal with his one agency on matters

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concerned with waste disposal than with 5 or 10 individual industries if the agency was responsible.

The advantage lies in dealing with a professional group that is primarily interested in the same thing that we are interested in, waste disposal, and being able to get answers. Let me give you one specific where this worked.

We had a fiendish time dealing in Missouri with the industries in St. Louis and St. Louis County. When we got to St. Louis, the St. Louis Metropolitan Sewer District took over all the industrial and municipal waste. We found ourselves dealing with one large entity that was devoting full-time to waste treatment; one that was on the telephone and has been on the telephone with us practically on a daily basis; and certainly one in continuous communication with a State agency and Regional office. We find that is easier to administer.

Now, if you are against this, I think we should talk in terms of real specifics because I don't want to --

DR. BUSCH: Let's talk about effluent quality.

Dr. A. Busch

MR. STEIN: The whole national push seems to be going in the other direction, sir.

DR. BUSCH: Well, I felt I should come down and talk.

MR. STEIN: Right.

DR. BUSCH: The issue is not addressed to me; the issue is effluent quality.

Now, let's take a specific case of a large, say paper mill and a small chemical plant out here on Highway 90. You can run the names down, and it's perfectly true.

This paper company is doing a great job from what I hear, but its volume is so large that a small sludge facility that has not been doing a great job if dumped into the sewer would disappear in terms of chemical analysis. This puts it into a different problem than you gentlemen discussed the other day. A concentrated waste of small volume can be grasped and handled in a treatment system. Diluted sufficiently, it is not even visible in terms of chemical analysis.

Now, what concerns me about so many centralized waste facilities is that some critical

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wastes are going to be diluted and the same number of pounds will be going into our natural system even though the concentration may be down to where our standards are accepted. This is simple arithmetic. There is nothing esoteric about it. It is just a fact. The more volume mixed with strong concentrated low volume waste, the more we are apparently going to solve a problem where we really just diluted. We are back to the old story, "The solution to pollution is dilution." If you have a large volume of low strength waste, you can conveniently eliminate a small volume of concentrated waste by simply digesting it. This is the type of thing I am concerned about -- the actual accomplishment of elimination of pollution and not just the dilution of it.

MR. YANTIS: Thank you, Professor Busch. I think your views are valuable. I think they should be included in the processes. I know you are aware there are quite competent consultants who think differently.

I think it is quite proper, though, that from among all of the ideas that have been suggested --

H. Yantis

and there have been ideas suggested that have not been talked about here today and will not be, there are simply too many of them -- from among all of them, some groups -- it may not be the right group, but it will be the group appointed by the government to make the decision -- will select a method of approach. As the one to go on. But everyone has the right to have his opinion go into the decision-making process.

Now a group that has been waiting most patiently, as several groups have I guess, is the Clear Creek Student Water Quality Program. Linda Betancourt has either questions, a presentation, or both. I can assure you, as I said earlier, that what the students think is very important. It is equally important where they are wrong that we correct them in a way in which they will believe.

Now, why do I say that? Because yesterday and the day before, even after some of the most solid facts were laid out before this meeting, I heard some young people and some older people say, "I simply don't believe it because the channel is still dirty." Well, of course the channel is still dirty, but it is getting

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better. It is just like filling up a well with dirt; you put some in it every day and you say, "Is it full yet?" No, it is still not full until you put in the last shovelful. It is still not full but something has been done.

So, I am especially interested in having Linda Betancourt and any other of her group speak to us, because they are the future.

MISS LINDA BETANCOURT, REPRESENTATIVE
CLEAR CREEK BASIN STUDENT WATER CONTROL MANAGEMENT
CLEAR CREEK HIGH SCHOOL
HOUSTON, TEXAS

MISS BETANCOURT: This will only take about 5 minutes, and it is just a presentation.

Mr. Stein, Mr. Vanderhoof, Mr. Yantis, ladies and gentlemen. My name is Linda Betancourt. Today I am representing the Clear Creek Basin Student Water Control Management Program, a local community-funded group of 18 high school students from the Clear Creek High School who are spending this summer investigating major technical questions pertinent to improving the quality of water in this basin.

L. Betancourt

This program was conceived by Mr. Socrates Lamprose, Chairman of the Board of the Water Control Improvement District #50, El Lago, Texas. The coordinating sponsors of this program are the Gulf Coast Waste Disposal Authority and the Earth Awareness Foundation. The program is administered by the University of Houston under the direction of Dr. H. Nugent Myrick and several of his graduate students. The contributing sponsors of the project are the local water quality improvement districts, municipalities, 3-county regional governmental authority, local businesses, local industry, the U. S. Air Force, and most of all, local, nonbiased, interested citizens. For example, the "Earth I Care" Club of Clear Creek High School raised over \$1,000 by door-to-door contributions and sales of posters which were contributed by internationally renowned cartoonist Johnny Hart. We are also very indebted to the staff and Board of Education of Clear Creek Independent School District for the use of school facilities and faculty advice of Mr. Jim Walters, Chairman of the Science Department.

The purpose of the program is to locate, tabulate and evaluate previous information; conduct

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water quality monitoring programs and pursue in an exploratory manner selected technical questions which may be pertinent in arriving at several basic public policy questions in reference to both lake and stream quality standards as well as effluent quality standards.

At this time, we would like to ask both conferees to become more interested in our program. We trust as we visit with you in the future we will observe your support in this program. We feel through this program we can work locally very effectively to insure improved water quality standards in our basin through education of our fellow students and parents on the complex technical and public policy questions to achieve our State and National goal, clean water.

During the next 9 weeks, we shall be working very hard to achieve our goals. At the end of the study, we will be pleased to submit to you our findings. We trust that the conferees will sincerely consider these findings and incorporate them in your program of action.

Thank you. (Applause.)

MR. YANTIS: I think some of your group is

L. Betancourt

gone, but will all of you that are here please stand up.
(Applause.)

MR. STEIN: We really appreciate your group's
coming in.

MISS BETANCOURT: Thank you.

MR. STEIN: I do have one comment on that.

MISS BETANCOURT: Yes, sir?

MR. STEIN: I know that everything changes
with each generation, but we were talking about solid
facts. I am reminded about a class like yours in
geography in the 14th Century when the teacher asked,
"Does anyone know what the shape of the world is?"
One kid said, "Yes," She said, "What is it?" and the
kid said, "It's square." Another kid shook his head
and raised his hand. The teacher said, "You don't
agree?" He said, "No." She said, "What do you think
the shape of the world is?" And he said, "It's
shaped like a chicken." There was a titter and she
said, "Are you sure?" and he said, "Well, maybe an
egg." (Laughter)

MR. YANTIS: As we get ready for another
speaker, I would certainly confess for myself, I think
most of you would too, that when I was their age I

Mrs. B. E. Bremberg

hadn't done anything. (Laughter)

MR. YANTIS: Is Robert Moore from the Sierra Club here now?

There are a lot of people who had intended to speak who could not stay and who will be back. When I call someone's name who is not here, I will call it again later on or tomorrow, if there is a tomorrow's session, and it still looks like there will be. So, I am just going from the top of the list, then.

For the League of Women Voters I have two names, Mrs. James Grover and Mrs. Bruce Bremberg. Are they here?

Please come forward and tell me which one you are.

MRS. BREMBERG: I am Mrs. Bremberg.

MR. STEIN: Thank you.

MRS. BREMBERG: Thank you.

MR. YANTIS: May I have an estimate of the time? Would you rather speak from here where you can be seen?

MRS. BREMBERG: Nobody needs to see me. They can hear me. (Laughter)

MR. YANTIS: I disagree, but go ahead.

Mrs. B. E. Bremberg

MRS. BRUCE E. BREMBERG
ENVIRONMENTAL QUALITY CHAIRMAN
LEAGUE OF WOMEN VOTERS
DICKINSON, TEXAS

MRS. BREMBERG: I am Mrs. Bruce E. Bremberg, Environmental Quality Chairman of the League of Women Voters of Texas, speaking for the more than 4,500 members in our State. We would like to thank the EPA for the opportunity to express our views. We would also like to say how refreshing it is to have a responsible as well as a responsive agency "minding" the environment.

For the past 16 years -- which I believe would predicate we are newcomers -- the League of Women Voters of the United States has politely but firmly suggested to Congress, State legislatures, local councils, boards and commissions that statutory laws and ordinances with adequate funding, staffing, and enforcement powers are absolutely necessary for pollution abatement.

Unfortunately, too often visions of immediate dollar signs have danced through the heads of the recipients of these messages and only lip service has been paid to the problems. Hundreds and hundreds of resolutions deploring the polluted waters have been enacted -- countless interim study committees have been legislatively created -- magnificently researched and

Mrs. B. E. Bremberg

printed reports have been filed and forgotten -- all in the name of pollution abatement. Power plays among special interest groups and enforcement agencies are the norm. Dissension among environmentalists has also contributed mightily to the vast amount of inactivity. However, we have all acknowledged the problem, written and read the reports, and have actually run out of stalling tactics -- so let's stop playing the game that I affectionately call POTS and KETTLES. We have done our worst, and in some cases our best, to ignore this mess -- it is now time to get on with cleaning it up.

Statements from industry that they will move away and leave an economic void are just not valid. Where would they go? Will they abandon a tremendous capital investment to make an even larger one in a State with corporate income taxes? Will another State accept their pollution? I think not!

The old saw about the cost to the consumer is absurd on the face of it. Who is now paying all the costs, directly through purchases or indirectly through subsidies and grants? Whose money is paying

Mrs. B. E. Bremberg

for the maintenance of the channel and the bay? We are -- the consumer-taxpayer, that's who.

And if, instead of cranking up a public relations campaign on how intesely interested they are in the environment, they had gotten down to the business of cleaning up their mess, real progress would have been made years ago. Improved profits and inplant efficiency by recycling and reuse of wastes now discharged into our channel and bay might be an established fact, rather than an anticipated goal.

We recognize and praise the industries that have nationally allocated millions for pollution abatement. The paper industry is upping its ante 110 percent, chemicals by 56 percent and petroleum by 50 percent -- incidentally, the railroads buy nothing. Those efforts are noteworthy and deserve commendation. However, condemnation should be heaped upon channel polluters for expending money and effort to repeal the 1899 Navigable Waters Act. Does this indicate the true feelings toward pollution abatement? Does the fact that the proposed environmental legislation

Mrs. B. E. Bremberg

was defeated by lobbyists representing the polluting industries show the real attitude? Why are legislators who earnestly try to provide means of environmental cleanup ridiculed by their colleagues? Has political responsibility become old-hat? Are integrity and endeavor dirty words?

In our innocence, we were appalled to hear the Executive Director of the Texas Water Quality Board, Mr. Hugh Yantis, address the major polluters of the channel and bay as "sufferers" under the 1899 Act, as he urged them not to be silent, but "get on" their Congressmen about said Act. We thought he was on our side -- charged with and empowered to keep our water quality standards high and inviolate. So much for innocence!

Another thing that has disturbed the League for a long time is that the United States taxpayer has had his money spent to create new and devastating pollution problems in the form of subsidies. Government Agencies and Departments have given tax monies in the form of grants that have resulted in deleterious effects on our environment. No one has the right to pollute or poison our water, but evidence

Mrs. B. E. Bremberg

shows that many have the privilege of doing just that by permit and variances of permit requirements.

The Texas Parks and Wildlife Department -- charged with the protection of our bay bottoms -- receives revenues from the sale of oyster shell, sand, and gravel dredged from those very same bays. Ironical, isn't it, that an agency created for environmental and wildlife protection should have to rely on a destructive activity for a portion of its funds?

The Texas Water Quality Board directly charged with water protection doesn't seem to want the responsibility if it means complying with and cooperating with Federal Agencies. Why have they adopted an attitude of injured pride, spurious State loyalty, publically challenging the competence of Federal Agency scientists instead of taking firm and cooperative stand on enforcement? Is it because it is so much easier to encourage the repeal of the 1899 Act than it is to enforce its provisions? Where is there a law that says enforcement is easy? Quality control is hard, costly, — it cost a lot of money — and extremely unpleasant. However, the inability or unwillingness to carry out the mandate of the State and

Mrs. B. E. Bremberg

Federal laws can no longer be tolerated.

What we need is a clearly defined and enunciated public policy at all levels to protect our estuaries, money to implement and enforce these policies, trained and qualified personnel. We recognize that estuary protection does not automatically mean locking up an area and preventing development. Passage of ships and barges can be compatible with good estuary management. Careful analysis is needed to see what our estuary can accept without damage and what uses should be prevented. Obviously, this has not been done here -- no one asked for answers to the questions: Will schools, police and fire protection, waste collection, roads, water and sewerage systems, and health measures made necessary by the construction of a project or industrial complex cost more than will be collected in taxes? How many local people will be employed and at what kind of jobs? Will people be brought in from elsewhere to fill most of the positions? Will employment of local people be temporary, perhaps only during construction? Will gains in income be limited to the mercantile and service

Mrs. B. E. Bremberg

businesses? Will adjacent property values decline? Will existing industries be adversely affected. Will some other potential source of income be nipped off before it develops? Are there other possibilities, environmentally more desirable, which would be preferred by the local people if all the ramifications of the proposal were understood and truthfully presented?

Public policy need be neither preservation of all estuaries not already severely damaged -- nor their restoration to pristine purity -- nor the most violent exploitation for the fastest economic return. The goal can be to provide for many of the conflicting demands, public and private, and still obtain the greatest long-term social and economic benefits. Private rights must be considered, but the collective rights of all of us to our natural heritage should equally balance the scale!

Let's put aside our petty bickering as to who is going to do what, and combine our energies, efforts, knowhow, and dollars to the cleaning of our nest! The time for positive action is at least a century ago.

Mrs. B. E. Bremberg

Thank you very much. (Applause.)

MR. YANTIS: Mrs. Bremberg, as positively and clearly as you state your views, if you had my job, you would also be known as a controversial executive director.

MRS. BREMBERG: I am kind of known as controversial right now.

MR. STEIN: I would like to point out one thing. In deference to the State, I guess it is their privilege if they want to encourage the repeal of the 1899 Act. But, you know, if anyone has done that, you don't know what you are going to get in its place.

But then you say to "enforce its provision." Well, it is not the State's job to enforce the provisions of the 1899 Act; it is ours. We are doing it, and we are going to have an enforcement or permit system applying to all the industries in the country, including the industries that appear here, which is going into effect this July 1.

This always cuts 2 ways. Related to this permit system, there are a number of people who want

Mrs. J. Grover

to repeal it and not have a permit system for the industries. Other people think this permit system is such a good idea that they want us to have it for both industries and municipalities. You can take your choice.

MRS. BREMBERG: I realize when I said that, I hadn't delineated that it wasn't your responsibility to enforce it. I caught that.

MR. YANTIS: There are all shades of opinion, and I enjoy debating with people whose views differ from mine. I wish we had time to do it.

Did Mrs. Grover work with you, or does she have a separate presentation?

MRS. JAMES GROVER, CHAIRMAN
ENVIRONMENTAL QUALITY COMMITTEE
LEAGUE OF WOMEN VOTERS, HOUSTON
HOUSTON, TEXAS

MRS. GROVER: I have a separate presentation. We had hoped they would not follow each other.

MR. YANTIS: Is there any reason why they shouldn't?

Mrs. J. Grover

MRS. GROVER: They somewhat express the same views. If you want to hear it reinforced I will be glad to right now.

MR. YANTIS: All right.

MRS. GROVER: I am Mrs. James Grover, Chairman of the Environmental Quality Committee of the League of Women Voters of Houston. There are several leagues in the Houston-Galveston region, and I am speaking only for the 650 members of the Houston League. I would like to welcome all of you with the Environmental Protection Agency to Texas, and I hope the attitude you have seen displayed by many of my fellow Texans will not make you feel unwelcome.

(Laughter)

The League's interest in water resources began in 1956, and since that time our members have been involved in many facets of water resources development. Our goals in this field include 1) overall, long-range planning of water resources development, 2) managing water resources on a river basin or regional basis, 3) improved coordination between agencies and departments, 4) citizen participation in water resources decisions.

Mrs. J. Grover

After listening to the State's case on Tuesday, I went home and threw away the paper explaining how I felt the above-mentioned goals pertained to this meeting that I had prepared previous to this conference. I started over simply because, after Tuesday, I felt I should concentrate on the third goal which was improved coordination between agencies and departments.

This goal should be an easy one to achieve, but in this case it may well prove to be the most difficult. In the Houston-Galveston region we have a wealth of governmental agencies with pollution abatement enforcement powers. The most specific ones affecting Houston are EPA, the Corps of Engineers, the Texas Water Quality Board, Texas Parks and Wildlife, the Railroad Commission, Gulf Coast Waste Disposal Authority, Harris County Pollution Control Division and the newly formed city of Houston Water Pollution Control Office. One wonders how the channel can even be polluted with all of these agencies taking care of it. (Laughter)

This conference has already accomplished

Mrs. J. Grover

one important thing. It has brought forth an amazing cooperation between State agencies. (Laughter and Applause)

Over and over we heard from these agencies that they are correct in their evaluations of the local situation, and the Federal authorities are not only wrong about everything but have an ulterior motive in calling this conference. United they stand. (Laughter)

Since its inception the Texas Water Quality Board has been operating under a mighty handicap -- limited manpower and a ridiculously low budget. Nobody could do the job required under those conditions. But don't those conditions still exist? Is the Texas Water Quality Board now able to devote enough manpower and funds to this area to see that our pollution problems are corrected in the least amount of time? For Pete's sake, fellas, the Feds have finally noticed us! They're here saying, in public mind you, that they are ready to help in any way to see that our pollution problems are ended. Can't the State capitalize on this instead of playing

Mrs. J. Grover

the injured party? Let's admit we do need help -- and then take it. Is Texas so endowed with knowledge we can't accept any more? Are we so rich we want to say, "No, thank you" to Federal funds? I doubt the people of this State would answer yes to that.

League members support strict enforcement of antipollution laws at every governmental level and stern penalties for noncompliance. We believe the many industries that have cleaned up their production processes want others to do the same. What we ask is cooperation among governmental agencies to make this a reality. Certainly those complying industries should not be punished for being good guys by having to compete with those companies still happily polluting away.

Duplication of effort wastes time and money -- both precious commodities. Governmental agency infighting does the same, and is even more unforgivable. This Nation has the ability to improve the condition of its water. Local, State and Federal authorities have been assigned the specific task of seeing that this is done. People are now demanding results!

Mrs. J. Grover

In closing I'd like to say that the League of Women Voters of Houston has another goal I failed to mention earlier, and that is to convince all of the powers that be that we want the Houston Ship Channel brought to at least a respectable state of cleanliness and we want Galveston Bay cleaned up in the shortest possible time. We feel the best method of achieving this will be by the combined efforts and money of the State of Texas and the Federal Government.

Thank you. (Applause)

MR. STEIN: Thank you, Mrs. Grover.

As you know, Mr. Yantis in his job is controversial, but if you had my job, you would have to get used to being unwelcome. This doesn't always happen. Usually when we go into a place, at first we are unwelcome. Then, after the pollution begins to get cleaned up, we become local heroes, and they give us the key to the city. I hope this will happen here.

I think this is working its way out. I really do. In our relationship with the State, you can't expect us to change very rapidly.

Mrs. J. Grover

You talked about this. Someone asked me yesterday, "How do the Texans view the Federal Government or look at the Federal Government?" I said, "Well, I have been here many times, and as far as I can see, they look at the Federal Government through the windows of the Alamo." (Laughter and Applause)

MRS. GROVER: I am a native Texan myself and all of us don't. (Laughter)

MR. YANTIS: Is Mr. Moore ready to put on his presentation?

You mentioned that after you saw -- I believe it was Tuesday's portion of the program -- that you rewrote your speech.

One of the things that I am repeating, partly because it grieves me mightily, is that there are people who can look at the presentation that Dick Whittington put on, showing the facts and figures that the load on the Houston Ship Channel in 4 years has been cut to about 1/4 of what it was before, and showing the aerial photographs of all of the new waste treatment plants, and still stand up and say, "Nothing has been done."

R. Moore

MRS. GROVER: May I respond to that? I did not say, "Nothing has been done."

MR. YANTIS: I am just speaking of the general public attitude. I hope very much, with the help of the press, that we can show, despite the fact we wear a black hat, it is possible to say, "A great deal has been done."

There are ways of getting things done besides going to the courthouse. There is a lot remaining to be done, but it is like filling up the well with dirt. There is some dirt in the well now, and unless Mr. Stein says there is some silt in the Houston Ship Channel -- well, I know that too.

Dr. Moore, are you approximately ready?

MR. ROBERT MOORE

ATTORNEY-AT-LAW AND PRIVATE CITIZEN

HOUSTON, TEXAS

MR. MOORE: I believe so, Mr. Yantis. Most lawyers who have received on their degree the right to be called a "Doctor" don't prefer to be so designated. I am an attorney, but I do have that title.

R. Moore

MR. YANTIS: I thought you were a medical doctor. Now, Attorney Moore, instead of Dr. Moore, introduce yourself and indicate whom you represent.

MR. MOORE: Let's make sure that I have this set up, Mr. Yantis. I am an individual citizen.

Mr. George Hagel, who is the President of the Sierra Club, called me about 2 days ago, and he knew of the evidence that I had been collecting with regard to protesting the drilling applications in West Bay and offshore. Also, Mr. Keith Ozmore had talked to me over the phone that same day and told me the limited scope of your inquiry.

So, I have taken the evidence, or the slides which show the evidence, and limited it strictly with respect to the effect of drilling applications and drilling for oil and gas as they would relate to shellfish in West Bay, Trinity and Galveston Bays, and perhaps portions of the East Bay.

I don't know whether it is the absence of lighting or focusing right now, but, we will try it.

[Slide.]

MR. MOORE: Excuse the delay, conferees and chairman, but if we would get these front lights

R. Moore

off, I think we could review the photographs.

In regard to your requirement that all evidence be in black and white, I also might inform you, Dr. Quebedeaux said he would help me in having these color slides reproduced in black and white for the record.

Is there any way we can get these front lights off?

MR. YANTIS: I'm not sure, and the reporter has to have some way of stenotyping.

MR. MOORE: Well, I think she does that by feel.

(Lights dimmed.)

MR. MOORE: Thank you.

I am sure everyone here has familiarized themselves with the geography of the general area we are talking about, but many people do not know of the existence of 200 wells producing oil in Galveston and Trinity Bays, and perhaps many people do not know of the pending applications of the Texas Company, Mobil Oil, the Cabot Corporation, and Clinton Corporation in making efforts to introduce drilling rigs and

R. Moore

structures in West Bay, which at this time has absolutely no oil production of any kind.

After World War II, there was a small amount of exploratory drilling conducted in that area. The Corps of Engineers said approximately 25 wells were drilled and all were dry holes. But it seems with the advent of technology the oil companies are able now to go on water areas and drill much deeper. Geologists say just because there were dry holes drilled there in the past certainly is not conclusive evidence there is no oil in this particular area.

Most people who live in this metropolitan area know of the high value which is placed particularly on West Galveston Bay for recreational purposes as it relates to the sportsman, primarily for gathering oysters, but also for sport fishermen using their shrimp trawls with the proper sports license to trawl for shrimp in this area.

Bait shrimpers also shrimp West Bay, and commercial oyster fishermen as well as commercial bait fishermen use West Bay in gathering some of their produce. The Department of Commercial Fisheries in

R. Moore

Galveston has given me statistics. I don't have them here today, but, in honesty the value of the commercial production of West Bay with regard to oysters and shrimp is very small in comparison to that of Trinity and Galveston Bay.

I am sure you gentlemen from the Federal end are aware of the tremendous commercial importance of the shellfish industry in that bay, and I presume that's why you are here today -- to try to protect that particular and vital industry.

Now if you will, the next slide.

[Slide.]

This is a blowup of the Galveston Bay area. To again familiarize yourselves, many people have the mistaken impression that when you speak of West Galveston Bay that is tantamount to speaking of Trinity and Galveston Bays. Trinity and Galveston Bays are so far gone people say, "What the hell, Bob! Forget about West Bay." That's not true because this particular bay is segregated, primarily by the Texas City Dike. If you look right up here at the top, you will see a yellow piece of paper which I placed

R. Moore

there to give you some idea of the location. That dike runs all the way back to the mainland (indicating). Then at the southwest end you have San Luis Pass.

Other than that, that bay is relatively protected from the water of the Trinity Bay. And of course you have the tidal flow in and out through the channel. Again I can't support this in terms of scientific data, but from the standpoint of being raised there and being a fisherman all my life, I know the main tidal currents carry right on out to the Gulf and come back in. There is very little of the highly polluted water from Trinity and Galveston Bays which reaches into West Bay proper.

Next slide, please. [Slide.]

MR. MOORE: Here is an aerial photograph giving you an idea of the Texas City Dike looking from west to east. This is the upper portion of West Galveston Bay, and this portion is the Galveston and Trinity Bays area.

I would like for you to note the effects because this is going to be important to my presentation of the effects of dredged or filled

R. Moore

material as it relates to the solubility of dirt particles in the water. When the wind blows in these areas that have been filled, there is a heavy suspension of dirt in the water. This clouds up the water and affects the production of oyster and shellfish in that particular area.

All right. Next slide, please. [Slide.]

Now, looking at the southwest portion of West Bay, we see Monsanto Chemical up here at the top. I presume there has been enough said about the other phases of oil production as they relate to pollution, so I am going to try to confine my remarks strictly to drilling operations per se.

The western portion of the Bay has currently an exploratory well which the Texas Company put here prior to July of 1970. They own approximately 50,000 acres in here and have over 50 producing wells over here at Hoskins Mound.

There is no runoff in this particular area and no suggestion that any of those producing wells have any effect on the marine environment in West Bay. However, there is an effect from this

R. Moore

exploratory well. As oil companies do, they have a very tight hold,, and there has been no evidence given out by their engineers or anyone else I know of not related to their company as to whether or not they made a find of commercially producable oil there.

In July of 1970, they got my ire up as a sportsman when they made application, or final application, through the Corps of Engineers to move out into the bay onto three State tracts. I have maps of these from the Land Commissioner's Office which will specifically designate the tract that I refer to, and I will submit these for the record.

About the same time the Cabot Corporation made application to move right behind Stewart Park which you gentlemen may not know is going to be the cornerstone of a State park system on Galveston Bay. The taxpayers of this State paid just about a million dollars to buy the estate from the Stewart heirs.

Right behind that park, 300 to 500 yards, the Cabot Corporation wanted to place a well in July 1970. Prior to their application to move into the

R. Moore

bay, they had already sought and obtained Corps approval to dredge across Bastrop Bay to float their drilling barge up to this point on land.

Now, one of the State tracts cuts across Bird Island which the Audubon Society leased in 1952 as a bird sanctuary. There are only two islands there that actually facilitate nesting and constitute homing islands for these birds. And, as I say, they wanted to get up next to those birds. I don't know what the relation is with regard to oysters, but I understand there is a delicate balance that when any species is affected, there may be a change of events which will occur even at the stage of oyster development.

Next slide, please. [Slide.]

Here is a picture of Bird Island and the area we are talking about.

The next one. [Slide.]

Here is another picture looking from east to west to give you an idea of the expanse of this bay. This bay is approximately 11 miles long from the causeway to the area that we are looking at right in the foreground and approximately 2 to 3 miles wide.

R. Moore

It is a very shallow bay. It would be safe to say that the average depth at ordinary mean tide is about 4 to 5 feet.

In order for any company to move in and conduct drilling operations in this bay, their applications contain specific specifications to the effect that they are going to have to dredge 8 feet from the bottom of this bay downward, and then deposit this material in the bay in the form of mounds.

Now this is the first most significant damage that is done in the bay. There is some suggestion that the Texas Parks and Wildlife would assist them in trying to locate the route that they would dredge these channels in order to minimize damage, but there is absolutely no evidence or suggestion that in the event that they had to in fact go across the oyster reefs they wouldn't conduct their drilling operations. In other words, the priority would be given to the dredging of these channels irrespective of the damage that might be done to the oyster beds.

A secondary problem is that, even if they

R. Moore

don't go across an oyster bed or a reef directly, the effect of the dredging is to cloud and muddy the water anywhere from a 100 yards to a half a mile depending on the wind conditions on this particular day.

When the Texas Company moved in to put the exploratory well down on that point which was shown on the map, I had a very good friend who is a sportsman of oysters in Bastrop Bay tell me that hundreds of oyster clusters were killed due to the silt, not because the silt or dredged material was placed on top of the reef but because the silt suspended in the water floated over and settled down on top of the reef.

He said he had as a sportsman in fact oystered that particular area for about 10 years and now they are gone.

He didn't suggest that they wouldn't come back, and I am not in a position to say scientifically it would be permanent or irreparable damage, but it certainly would be damage for some period of time.

Next slide, please. [Slide.]

R. Moore

This is to give you an overview of the bay. You have seen it from the standpoint of a map. When people come at you with statistics and black and white drawings it may give you some idea, but unless you have actually been in this area and have appreciated it either from the standpoint of a conservationist, sportsman, or just a fellow who likes to just get out, you can't really appreciate the beauty of this bay. Its integrity, of course, is not complete.

Champion Paper disposes out here. We will make some small mention of their operation. They don't do it directly. There is a company which I noticed on your chart out there; it's No. 1810182, McGinnis Main Company, etc. Mr. Yantis is familiar with this operation because several sportsman and other groups protested the erection of these mounds back in about 1968, I think it was. Is that not correct, Mr. Yantis?

MR. YANTIS: That's pretty close.

MR. MOORE: The main problems are the liquor that is a by-product of Champion's operation being deposited there and the retaining wall being

R. Moore

subject to high tidal erosion. If we had anything like Carla or even a Beulah, it could have the effect of releasing all of that material directly into the bay, the marsh and the estuary.

It is not only an eyesore from the air, but it is a very definite threat. It seems to me that if we could just hold what we have in West Bay, whether you are looking at it from the standpoint of its commercial value, recreation, industries, outboard motor sales, fish and tackle, or people who sell beer, it is worthwhile. This is a playground for a populated area such as we have in Houston, where the ordinary man can go out there and have a good day. It wouldn't take a great deal to preserve it.

Next slide, please. [Slide.]

This is another view. If you would, go ahead and flick them rather quickly.

[Slide.]

Here is another view showing the Intracoastal Canal, the estuarine area. Hold that one, if you will. This is one of the better photographs depicting the relative nearness of this bay. You can see the Gulf of

R. Moore

Mexico and Galveston Island. Here is the Intracoastal Canal and here is a marshy area on the mainland. Here is where the discharge of oil was placed by virtue of the dredging of the Intracoastal Canal.

This was taken in an airplane by Mr. Warren Sloan and myself back in April. We took all of these photographs together. I took some of them prior to him, but he took the others. All right. We took them together.

[Slide.]

You can notice that even on a relatively windless day and the bay has a chance to settle, you still notice all the brown areas close to any area where there is dredged or filled material. That has been there ever since the Intracoastal Canal has been there, which was back in the 1920's, if I'm not mistaken, when they dredged the new canal.

Again, I am stressing the effect that the dredged material has. You can see the relative narrowness of this bay. If you can, imagine having dredged channels going out to any location in this bay with the spoil placed in the bay. Not only is the

R. Moore

damage going to be done from the standpoint of uprooting the bottom of the bay for the 100 feet wide and 8-foot deep, but all of that material is going to go over for another 150 feet to 200 feet at least. You are going to have an area about the width of a football field just completely decimated. And we are not talking about the potential harm of the oil well area -- we are going to get to that -- we are talking about the right-now effect when they move that drilling rig into the bay.

Next slide, please. [Slide.]

Here is another picture showing basically the same view.

Next, please. [Slide.]

Again, this is looking from the mainland and you can see the city of Galveston in the background. Now I wanted to show you this one because I have a map showing one of the locations that Mobil wanted to come in on. This is what is known as Green's Cut. Here is part of a Karankawa Lake, and Green's Lake is right there (indicating). Mobil wanted to move out into 4 State tracts right in this area that my little pointer is encircling.

R. Moore

Okay. [Slide.]

Now, here is a good shot of Green's Lake. Their application included, gentlemen, not just the tract out in the water, but they also wanted the right to dredge 8-foot deep both in Green's Lake and Karankawa Lake. These little lakes I have fished in. You can't get out of your boat there. They are very shallow, about a foot or a 1-1/2-foot deep, and have very, very soft bottoms.

The shrimp larvae come in here as this is one of the prime development areas of the shrimp larvae. Again, if you can imagine the effect of taking 8 feet from the bottom anywhere in this lake, even if you didn't deposit it in the lake on low tide. Again, I don't have scientific data to support this, but from my observation in the marshes through the years I do know of one specific instance over on the Texaco property on Hoskins Mound where they dredged a drainage ditch about a mile long and changed the depth from 3 feet to 8 feet in the little hole where I hunted ducks during the winter. That lake is now completely dry with the low tide, whereas 5

R. Moore

years prior when I hunted, it never got completely dry. I suggest that any involvement in either this lake or Karankawa Lake would affect disastrously the ability of the shrimp larvae to incubate.

The next slide, please. [Slide.]

Now, at the upper end, close to the causeway, is the second island of significance and that is known as North Deer Island. This also is an Audubon Sanctuary and one of the only islands in the West Galveston Bay which has sufficient vegetation growing on the island to allow birds to nest. You can see all the white specks of the roseate spoonbills and various herons. It is a beautiful spot even if you are not an Audubon member.

Next slide, please. [Slide.]

The reason I show this island is because the Clinton Corporation, along with Mobil -- and it was the 4th oil company since July of last year that has tried to get into this bay to do it harm, in my opinion -- one of their tracts cuts across about 200 or 300 yards of the western tip of this particular island. It is a very long island, about 1-1/2 to 3 miles long, and it is literally choked and filled

R. Moore

as a nesting area for these birds. This picture, again, was taken -- all of these pictures are not older than April of this year. Some of them are as recent as 25 days ago, the early part of May.

The next slide, please. [Slide.]

Again, another picture moving on down from east to west along North Deer Island, and, again, giving you an idea of the value of that particular island.

Next picture. [Slide.]

Then, this is the very tip of it.

Now one of the State tracts that the Clinton Corporation wants to drill in cuts right across about here (indicating). And they made application about the same time. It was in February of this year, along with the Mobil Corporation.

All right. [Slide.]

Now, going back to San Luis Pass, I want to show you the extreme concern of the petroleum industry, and particularly Texaco. I invited them to see this presentation before in order to have proper opportunity to rebut it at the Audubon talk, which I

R. Moore

gave about a week ago. They failed to show, so I am not going to be very charitable to them.

[Next slide.]

This is a picture of Bird Island and this is a little bit off of their actual location -- their location is right about here (indicating), but the 3 tracts that they want to move in are out in this particular area (indicating). One, again, cuts across Bird Island.

Next photo. [Slide.]

Here is an aerial photograph of the location which they were in the process of drilling between July of 1970 and completion just a few months ago. When I say they completed it, they put a Christmas tree on this location, and again I don't know whether they made a well or not. You will notice the flow pit over to the side where there is hydrocarbon material. I haven't had it tested, and I don't know its chemical analysis, but it is high. This is to give you an idea of what happens to the dredged material when they put it on land.

Next slide. [Slide.]

This is Bastrop Bayou off to the left of

R. Moore

the photograph, and you can see this little boat going here (indicating). All of this was water right here looking just like this (indicating). That was just swampy, marshy area. They completely removed all of that in order to float the drilling rig in there and start their drilling operations. This is the discharge or dredged material, and, of course, they own this property in fee. It is not owned by the State, and they can do whatever they want with the land. I can't fault them for that, but I think it is a good illustration of the effects under the current drilling practices and operations of the oil industry of the degree of concern that they have for the ecology in this particular bay.

Next photograph, if you will. [Slide.]

Here is a picture. This is Bastrop Bayou and this is the western shoreline of West Bay. All of this is looking -- you can see very faint in the distance the skyline of the city of Galveston. That's about 17 or 18 miles away from this particular shoreline.

Again, you can see the boat going toward

R. Moore

the Christmas tree located there, and you can see the black hydrocarbon material located here (indicating).

Next photograph, please. [Slide.]

Another photograph. This is Galveston Island. You can see the Gulf of Mexico. This location is within 5 miles of San Luis Pass and shows dredge or fill material. It is approximately 1/2 mile long and about a 1/4 mile wide, and I would say it has an average of about 6 feet in height.

Next photograph, please. [Slide.]

Here you can see its relation to San Luis Pass. You can see the bridge right over here (indicating). You can see the Gulf of Mexico at the very top (indicating). Right here you can see the extreme western tip of Bird Island. This is Guyton or Mud Cut, which the fishermen use to get to and from Bastrop Bay and Galveston Bay. You can see all their little shanties which they just go out there and build and hope there is no hurricane that comes along and blows them down (indicating). Again, this gives you an idea. This photograph was taken subsequent to the original ones which I took, and this came back with me.

R. Moore

You can see this hydrocarbon material had already started to evaporate. It will evaporate to some extent. We don't know, as ordinary sportsmen -- I am not a scientist and don't purport to be, but I do want to keep up with what is going on down there.

Next Photograph. [Slide.]

Here is a picture to show those people who have never seen a well in water what one looks like. It is the same as the Christmas tree on land except it's surrounded by water. The effect it could have on water is what we are concerned about. And also the effect it could have on shellfish.

All right. The next photograph. [Slide.]

Here is a closeup shot of the pit that we were looking at, and you can see how it has started drying and decaying.

The next one. Go ahead. [Slide.]

Here is another shot showing that. You can see San Luis Pass bridge over in the background again to give you some idea of how close this is to a prime sportsman's area as far as shrimping is concerned as well as oystering. Next one. (Slide.)

Again, this is looking back toward Bastrop Bay just to give you an idea of this material. Next one. (Slide.)

R. Moore

You can see the relative height of the wall. You don't even need a Carla to allow this material to be dispensed into the surrounding water. When Beulah came in just a few years back we had just a 3-foot tide. A 3-foot tide would have completely enveloped this particular area and certainly washed the walls down.

It may be small in comparison to the other problems you are having with the major industries on the Ship Channel, but in my estimation it is the cumulative effect of all of these problems causing the final damage.

We can't point a finger and say, "You are doing it," and, he says, "No, not me; the next guy." This is why we are here where we are, in my opinion. It doesn't make any difference how small, apparently, on the face of it. I think it is something that should be stopped, and the only reason I am here is to implore you to do something about it.

Next one. [Slide.]

Here is a closeup shot again of the material. Again, I can't testify as to what the

R. Moore

chemical substance is, but you can certainly have your own scientific staff take some samples. I do have some in a Maxwell House coffee can. I don't know if it has been contaminated. It is in the trunk of my car.

(Laughter.)

I will be glad to turn it over to them. I haven't had time to have a chemical analysis made.

Next photograph. [Slide.]

This is to show you the concern that Texaco has in case the pit were to fill up with rain. Theoretically this material would float on the top and the water would go out on the ground and you wouldn't have any problem. My thought is, if it rained and the level got up there, certainly it would flow out into the ground.

I couldn't in all honesty, say I found any evidence of harm, and I suppose that's because it hasn't rained enough where it could flow out into the surrounding areas.

Next photograph. [Slide.]

This is to show you the mound material, one end of it.

R. Moore

The next one, please, Warren. [Slide.]

Here is another idea showing all the shale. It is replete with shell. Of course, it is dead shell that is down at the bottom. I don't know, but I suspect that this is a waste gas or oil flare which is consistent with their having made some kind of a find in that particular area.

Next one, please. [Slide.]

Now we want to move on over. I mentioned to you that about the same time that Texaco moved into West Bay in July of 1970 the Cabot Corporation came along and wanted to move into an area located approximately here (indicating). Well, actually that is wrong. It's more like right here on this tidal flat (indicating), and there is a little shell reef there.

Again, gentlemen, I tried to write the depths off of the map and show you that it is 6, 4, 5 -- in almost the entire bay you won't find any areas that are deeper than 6 feet. Most of it along the shoreline is about a foot to a foot and a half.

Next one, please. [Slide.]

R. Moore

Here is a rough map, which I drew up before I got the map from the Land Commissioner's Office. It gives the exact order of all these locations, and I am going to put it into the record. This shows Karankawa Lake, Green's Lake, the tract that Mobil wanted to get into, the Cabot Corporation here, and 1, 2, 3 tracts of the Clinton Corporation. One of the tracts shown cuts across North Deer Island which I mentioned to you. Here are only 3 and 4 -- one is 7 and 3 for Texaco. Eleven tracts. These tracts are approximately 640 acres or 1 square mile.

From the Texas City Dike all the way down San Luis Pass there are approximately 100 of these tracts. We are only talking here about 4 companies coming in with 11 tracts and you can see immediate damage. The way we usually do things in this State is just go ahead and do it and wait and see how bad it is, "pell mell type planning." I can envision someday having 100 channels dredged from one point to another in the bay under the way they are currently going about doing it.

I don't mean to suggest there is any way

R. Moore

they should be allowed to go in the bay. When they talk about good faith and come here to show you what I call "eyewash" about what they are doing. I don't really think the companies themselves are intentionally or meaningfully doing wrong. I think that it is a comment of where we are in our society in this day and time where we have what I call the "headless monster."

We have a degree of specialization where a man has an objective of finding oil. That's what his job is, and he is going to go find oil. He doesn't care what else is there. His paymaster tells him, "If you want to stay on the payroll, you have to be good and get the job done." So I think it is really the absence of planning; it is the absence of someone stepping in and saying, "Wait a minute. There are other considerations."

Next photograph, if you will. [Slide.]

Now, here is Mobil's. This is a photograph right off of the exact application with the Corps of Engineers. It is their proposed mineral development, West Galveston Bay. Again, this is as recent as February of 1971. This shows an area circled. It is Green's Lake. This shows Karankawa Lake which

R. Moore

they wanted to get into and these 4 tracts (indicating).

I want to make this comment here. In all fairness to the industry as a whole, I don't like to castigate the industry per se. I made a living going through college working as a roughneck for Texaco.

Right now Texaco is on my blacklist. Oil companies do not adopt the same policy. Gulf Oil, for instance, had applications in 11 tracts over in Bastrop Bay. With no more than 14 protests from individual citizens, they withdrew their application. Since July of 1970, I have filed a total of 72 protests against 27 different companies. Only 1 of the companies has seen fit to withdraw.

Texaco got better than 5,000 protests from the citizens that are concerned in July, and the Corps of Engineers said, "We are going to hold up. We will not grant your application unless you, Texaco, ask for a public hearing."

Mobil and Clinton got better than 19,000 protests in February and March of this year. Mobil, being sensitive to its public image -- not that any

R. Moore

of the companies are not -- wrote a very nice letter to Bob Brister saying, "We are really not going to do it, you guys. We are real sorry. It was an oversight. We are sportsmen and fishermen like you, and we are not going to go ahead and do this."

I thought it was a letter Bob got from the Corps of Engineers that Mobil had sent to the Corps of Engineers saying they wanted to withdraw their application. That is not the case. They have not actively withdrawn their application. This is, again, the kind of doubletalk that causes one to lose confidence in what you read in the paper. I think a lot of people got the wrong impression of Mobil Oil's policy because Mobil has not, in fact, withdrawn their application. Or if they have, then, Mr. Neely in the permit section has failed to find it because he told me he knew of no such letter in existence. The Clinton Corporation, despite the 19,000 protests, has not withdrawn.

People like myself are labeled as being irresponsible, in light of the energy crisis, and intimidated at every level. All types of charges are

R. Moore

hurled at us "because you are some kind of a nut" or "You don't understand our Nation's need for energy." I will be the first to suggest that there is an energy crisis. But I think that you can't take a blind-dog approach and just say -- just intimidate everyone because of that; use that as a banner to be able to continue to exploit and do whatever you want to to the detriment of society in general.

I think all of us are affected. We don't want a fuel shortage and we don't want any fuel problems. Neither do we want energy problems. But we do want responsibility in terms of allocating that particular cost to all of us in the products we purchase.

There are some areas that have a higher priority or higher needs or are less susceptible to direct effects on the public in general. You don't come down here to a bay that people use and enjoy, and can reach within their economic means to enjoy, and just go ahead and play havoc with that the way they have done in the past.

Next photograph. [Slide.]

R. Moore

Here again is a schematic diagram showing the actual intention of Mobil Oil, the way they were going to proceed. This is a cross section showing the channel to be dredged 8 feet deep, 100 feet wide.

The mounds of dirt were to be piled up to a height no higher than 6 feet above the water level. They were to be 300 feet or 100 yards -- 100 yards or 300 feet in diameter or about the length of a football field.

And they will be placed here and here and here and here, right on the side of the channel. I submit to you, sir, they are there forever. I don't believe anyone is going to come along and remove those for them. You can imagine with 100 tracts in that bay the effect of just one of those. They are going to be pockmarked all over the bay, and the motion created by the wave action on these mounds of dirt would just suspend that over any oyster reef and kill it without any question.

Then the little basin for drilling barge site is only 200 feet wide and 750 feet long. That's like the length of 2 football fields by 1 football field wide. I submit to you, you can imagine 100 of

R. Moore

those in that bay, because if oil is found, I'm sure that everyone will get in on the job, and they will develop every tract in that bay.

Next photograph. [Slide.]

Now let's say that I am talking about the effect of dredging. It doesn't make any difference whether they find a well or they don't. It's a dry hole. That damage is done and left permanent, forever.

All right. Let's look at the other problems they create. Suppose they find a well and make a well. Then they are going to erect a beautiful little old galvanized tank battery to store the oil out over the water and lay a flow line from that over to the shoreline where their collecting station is. They say that if they go across a shell reef or oyster reef -- the way I interpret that, they will go only down to 1 foot deep and jetty it, or whatever is the easiest way to get across a shell reef. If there is no shell reef, the pipe will go on down to 1-1/2 feet.

Now, this is the second major argument

R. Moore

that I am proposing in terms of showing the immediate damage. We are not even talking about the things that make so much publicity, the giant oil spills like Santa Barbara or Chevron. I am going to talk about that too because that is also potential damage. I think the Houston Sportsman's Club has spoken here prior to this about these 2 problems. I don't mean to be redundant. I didn't hear their talk. I do know this is my first recognition of this as a real danger in the bay estuarine areas.

Next photograph, please. [Slide.]

We are looking at this to give you some idea of the size of one of these drilling barges. This one is currently drilling out in Trinity Bay.

Next one. [Slide.]

Here is the front view of it so you get some ideas.

I am going to mention one of the 4 items of damage that results from the drilling operations. You will notice all of these fuel drums sitting on the top. All roughnecks know that is solvent used to wash down your tools.

R. Moore

Next one. [Slide.]

Moving back, here is a closer aerial photograph of the Champion Paper discharge into this McGinnis Company or whatever their name is. They are off the Intracoastal.

Mr. Yantis did -- I have to give him credit -- he did do something for the public when the public tried to prevent the maintenance of this particular operation. Babe Schwartz did everything he could, as you recall, Mr. Yantis, to argue that you all shouldn't allow this operation at that particular location.

Mr. Yantis, and with all due respect, I think he deserves credit for this, set a recreational standard which is the highest quality standard that can be given any body of water in West Galveston Bay. While there are a lot of things you have done, Mr. Yantis, I do think you deserve some recognition for that. However, I am not going to be with you, sir, on most things. (Laughter.)

Next one, please. [Slide.]

R. Moore

Here is another, (indicating), this is the result of the caustic soda that has soaked the chips down. That is what is called "black liquor," the material that has such a high BOD rating and is very harmful and destructive.

Of course, ultimately, when this material is seasoned and there is a dissipation, there is absolutely no harm done to its getting out into the environment in any form.

As a matter of fact, if I'm not mistaken, Mr. Yantis, when it is actually discharged on the ground, it has some beneficial effect. The landowner here is filling his land with that material.

But, you can't deny the fact that if this escapes anywhere in that bay, it will not only cause and produce a tremendous fish kill but if it is in the area or vicinity of any oyster reefs, you can say goodbye to those too.

Next one, please. [Slide.]

Moving over to the problems, we will show you we have 2 phases of this.

Remember, sir, that in West Galveston

R. Moore

Bay, there are no existing oil wells. We do have some in Trinity and Galveston Bays, and again I am going to ask you, at the conclusion of this, to give a directive to the Corps of Engineers to absolutely deny those permits that are pending by Texaco, Mobil, Clinton, as well as the Cabot Corporation. Do not allow them that waste of the public's time of holding a public hearing so that people who are emotionally charged up and have no facts and statistics can be generally whittled and cut away by the efficient industry teams. They whittle away and show the statistics, and then the Corps of Engineers goes ahead and makes a finding in favor of granting the applications, as they have in so many other conservation matters.

Please, sir, I beg you to save us all that grief. You have that power and authority to issue a directive to them to absolutely prohibit any applications in West Bay. (Applause.)

And further, prohibit any further applications in Trinity and Galveston Bays. Cause the industry to clean up its own backyard in

R. Moore

Galveston Bay and Trinity Bay.

Now, the areas in green show the known existing oil fields and the areas in red are the existing gas fields in Galveston Bay. The dark lines that are represented here are the major pipelines emanating from each of these particular fields. There are over 200 wells in Trinity and Galveston Bays. Each one of these wells has a flow line that collects at some central point. When I got involved in this matter in July, I started asking for maps that would show the location of all of the flow lines in the bay, and it came out in one of the papers that no one in any State agency had any idea of where the flow lines were located.

The sport fishermen through the years have known that there have been tremendous oil spills in Trinity and Galveston Bays due to the rupture of these flow lines that come from the oil wells to the collecting point. Some of it was caused by deterioration of the flow lines themselves just rusting through the years.

A lot of it was caused by the shell dredgers

R. Moore

not knowing where the lines were. Of course, it wouldn't have made any difference anyway. They just chomp, chomp, chomp and cut the well lines. The wells would produce for days and you would have great oil slicks. This was all prior to the time that Santa Barbara came along and the Chevron and Shell incidents.

Oil slicks and oil spills are certainly not new to the fishermen who fished the bays through the years. You oldtimers who are older than I am remember it. What could you do? You cry, you write letters, you ask the sports writers to do something, and you know you are muffled and no one ever hears you.

So, they just keep on letting these flow lines break out here, Mr. Vanderhoof and Mr. Stein, and these flow lines -- you can imagine. There are over 200 of them out here and nobody in the Railroad Commission, Land Department or any other State agency knows where they are located. The only ones that know are the individual companies. They are trying to get a map together, I understand, for the Railroad Commission.

R. Moore

I asked to find out how much oil was actually produced out of Trinity and Galveston Bays, in order to be repsonsible before I protested this, to see whether or not the equities ought to be balanced. And the fact that we do need oil, if there is a tremendously valuable deposit of oil in this particular bay, well, then maybe I ought to hold back -- and I know that we do need oil -- and see if that requirement didn't have a higher priority than the potential oil spills. I can't find out.

A petroleum consultant told me it would cost \$500 to get the Railroad Commission to search their records and give me production on a daily basis of the amount of oil we get out of Trinity and Galveston Bays.

And I certainly hope, Mr. Stein and Mr. Vanderhoof, that you gentlemen get on that problem and find out so we can have a determination and see whether or not it is useful to maintain the continued production of those wells.

Next photograph, please. [Slide.]

R. Moore

Here is an aerial photograph showing the little wells as they exist out there in Trinity and Galveston Bays and the various gathering points. You can see the individual well locations.

Not only are they an eyesore, but, as I said, you can imagine there is a flow line going from this one and there is a flow line going from this one (indicating) and, like I said, each one of them.

MR. YANTIS: Mr. Moore, so we can schedule the stenotypist's rest period, how much more time do you need?

MR. MOORE: I have been "sitting on this egg" a long time and have got to get it hatched.

(Laughter and Applause.)

Here is another photograph showing about the same.

Go ahead, Warren. [Slide.]

Here is a photograph showing the shoreline up near Baytown. You can put in at Thompson's Landing, which I did to take the succeeding photograph. This is a drilling rig I took a photograph of (indicating).

This little field has 32 wells in it.

R. Moore

The next one, Warren. [Slide.]

Here is a picture of one of those wells as it exists now, or did in the early part of April or May of this year.

This is the Standard of Texas location, a 640-acre tract, Tract No. 110-22. A beautiful sight to behold (indicating). (Laughter.)

Fortunately, the million and a half population doesn't know what exists out there. Sport fishermen do.

Here is a closeup shot (indicating).

I noticed they were out there doing a tremendous amount of maintenance that day. Maybe they heard that you folks were coming to town, but they used to look real bad, and now they are really out there doing a good job of housecleaning.

The next one. [Slide.]

Now, this is what I had referred to (indicating). This is a central point in that particular field and you can see the 32 flow lines as they come into this one collection point. Here they are working there that day (indicating). They are getting all that rotten wood thrown out and are

R. Moore

going to put some steel beams in there. Now and I can't impress upon you, Mr. Stein and Mr. Vanderhoof, the number of times in the past 20 years that these flow lines in that bay have been ruptured, and we have had very significant amounts of oil dissipated in that bay.

How anything lives there today I will never understand. But, fortunately, they are pretty hearty, evidently -- the shellfish. But I will give you some data into the record of the effects of oil on shellfish in a minute. [Slide.]

The next one here is another aerial view of another field out in the bay.

The next one. [Slide.]

Here is down toward Smith Point and San Leon. You can see in the background another drilling rig out there.

In April, there were only 2 wells being drilled. I just got another notice from the Corps last week. Chevron is moving in, and they are going in every week. I get a notice and I send a protest letter. Nothing is going to happen because the

R. Moore

good old Corps is going to let them go on in there.
They are already there.

Next. [Slide.]

Here is another shot showing essentially
the same thing.

The next one here is a shot of the drilling
rig actually in operation.

Next one. [Slide.]

Here is a closeup picture of the barge.

Next one. [Slide.]

Now, my fourth point is, even in the
process of drilling, we first have the problem of
dredging the channel.

Secondly, we have the problem of again a
very small insignificant amount, in some people's
minds, but, if you don't like oil on water, regardless
of what quantity it might be in, that oil you can see
starts dripping down from the top where they wash
off their tools.

It isn't actually oil; it is a refinement
of the oil or chemical solvent. It's not like kerosene;
it has more of an oil base to clean your tools down.

R. Moore

When the roughnecks are through cleaning down and washing down and swiping down the equipment, you take a hose and wash it out and that is washed off into the water.

Next one, please. [Slide.]

You can't see much there.

Next one. [Slide.]

Now, I threw my paddle of my boat out there so I could focus. You can see the existing oil slick in and around this drilling barge. I submit to you gentlemen anytime there is a drilling barge out there you are going to have some oil coming off of it. Not out of the ground, but with the same result.

Technically, this would be a violation of Federal law. If there is any form of a rainbow that could be discerned, it would be a technical violation.

Who in the hell is going to be out in the boat looking for these little type oil slicks except a nut like me?

Again, they are small, but they are

R. Moore

significant in showing disregard. I guess that's the thing I am most concerned about, the disregard of the industry toward the problems of the bay.

The next one. [Slide.]

It's the same.

Next one. [Slide.]

Now, the fifth is perhaps the most dramatic, though not the most important problem in regard to drilling operations in the bay.

They haven't any wells out there to my knowledge in the bay that have sufficient pressure that would produce the problem that we have as shown on this Chevron rig. But again, today technology is better, and they can go to double the depths that they did in these old fields out of Trinity Bay that have been there 20 or 30 years. But most geologists agree that just because West Bay has a lot of dry holes, again that's not conclusive evidence that there isn't another Prudhoe Field similar to Alaska right out in the bay.

If you did have any kind of a well that had the bottom hole that makes this problem such as

R. Moore

Chevron, then that is a potential damage or harm.

Next one, please. [Slide.]

More of the same.

Next. [Slide.]

And, of course, this shows what it looks like when they snuff it out and that they dissipated into the bay. Then, after it is in the bay, they do exactly what the scientists at the Woods Hole Oceanographic say you shouldn't do -- and that is to put detergents on it so it will sink and go to the bottom. That's kind of like sweeping your dirt under the carpet in your house. It really isn't gone. It will do much to oysters in the bay if this type of procedure is allowed.

Next. [Slide.]

I have some evidence from Dr. John Hunt. I don't know if you gentlemen are familiar with the work that he and Dr. Max Blumer have done at the Woods Hole Oceanographic Institution.

Probably many of you have read in the papers recently what I call the propaganda that the petroleum industry is disseminating.

R. Moore

Okay? Even if you have a major oil spill, it really doesn't do any harm. You probably recall here recently there have been some reports from the effects of pollution in Santa Barbara Channel, and the flora and the fauna haven't been damaged, and they can't find this. And I understand most of these people are on the retainer of the oil companies to some extent. But more important is they claim there, many, most, after the original kill -- and these people, fortunately or unfortunately, whichever way you want to look at it -- had a scent right close by in their backyard, and they immediately got out there to determine the effects of oil on the marine environment.

I am going to submit into the record the the testimony of Dr. Mx Blumer before the Antitrust and Monopoly Subcommittee of the United States Senate in August of 1970.

[The above-mentioned testimony follows.]

TESTIMONY OF MAX BLUMER
BEFORE THE ANTITRUST AND MONOPOLY SUBCOMMITTEE
UNITED STATES SENATE

Washington, D. C., August 4-6, 1970

CONCLUSIONS

A moderately large oil spill has occurred off the shores of Cape Cod in September 1969. In the first joint investigation of its kind biologists and chemists of the Woods Hole Oceanographic Institution are examining the damage done to the marine life and the persistence of the oil in the environment. Oil from this spill has killed a wide range of marine life. The pollution at the sea bottom is still spreading, ten months after the accident, and now covers at least 5000 acres offshore and 500 acres of marshes and tidal rivers. The polluted area has not yet been repopulated. Shellfish that have survived the spill in the less contaminated areas have become polluted by the oil and are now a public health hazard. Therefore, large shellfish areas had to be closed in the Fall of 1969 and the area had to be extended further in 1970. Shellfish that have taken up oil cannot cleanse themselves, if they are transplanted into uncontaminated areas.

Petroleum and petroleum products are poisons for all marine organisms and for man. Petroleum contains many poisons, among them substances which cause cancer in animals and in man. Therefore, the presence of petroleum and of petroleum products in marine foods constitutes a public health hazard which should be taken seriously.

Existing countermeasures against oil spills differ in their effectiveness and desirability. Some are purely cosmetic measures (detergents, dispersants and sinking agents) that push the toxic oil into the environment and cause more harm than if the spill were left alone. Countermeasures are completely effective only if all the oil is recovered immediately after the spill. The technology to achieve this goal does not exist.

Oil spills of various types now introduce between 2 and 10 million tons of oil into the ocean every year. With increasing production and transport and with a shift of the production to more dangerous locations in the Arctic and on the Continental Shelves, spills will increase more rapidly than the oil production. This large influx of oil into the ocean causes severe damage. Only through recent investigations, like that of the oil spill in the Cape Cod area, have we become aware of the great hazard that oil constitutes to the marine ecology, to fisheries resources and to human health.

We urge that all precautions must be taken to prevent oil spills. In terms of cost effectiveness spill prevention is far superior to clean up. In offshore drilling conservation must be practiced. It must not be aimed, as in the past, only at utilizing the oil reserves in the best way. Conservation must now include the protection of the environment and the maintenance of our recreational and fisheries resources. In the granting of offshore leases consideration must be made of the ecological hazards and the danger to fisheries resources and human health. In future offshore leases a percentage of the revenue should be allocated for environmental protection. These funds should be used for a survey before and during production, for the funding and establishment of laboratories to carry out such surveys and for research on the effects of oil pollution on the marine ecology, on fisheries resources and on public health. These funds should support training and education in marine ecology and in the pollution field.

I am thankful for the invitation to appear before the Antitrust and Monopoly Subcommittee to discuss the risks inherent in expanded offshore drilling and oil transport. I have studied the fate of hydrocarbons in the sea and in marine organisms for many years. At the Woods Hole Oceanographic Institution with which I have been associated since 1959, my work centers on hydrocarbons in the marine food chain and on their effect upon marine organisms and man. A study of the aftermath of an oil spill close to our laboratory has shown us how little we knew about the effects of oil pollution on the marine ecology.

I wish to review our findings of the ecological and commercial damage caused by this oil spill. Later I will comment on the toxicity of oil in the environment and the present state of the art of countermeasures. I will conclude with a discussion of the world wide problem of oil pollution and with recommendations for environmental protection.

THE OIL SPILL OF WEST FALMOUTH, MASSACHUSETTS

In September 1969 a fuel barge ruptured her hull on submerged rocks off West Falmouth. The cause of the accident was an error in navigation under conditions of good visibility. Approximately 650 tons of #2 fuel oil were discharged into the coastal waters. Chemists and biologists at Woods Hole are studying the immediate and long term effect of this spill. The oil involved in this spill is a refining product of petroleum. It is contained within the crude petroleum and as such it has effects which are typical both for unrefined oil and for refinery products. However, some differences exist in the mode of toxicity of different petroleum products. Thus, the lower boiling oil products, such as gasoline and kerosene, contain higher concentrations of many fast-acting poisons; on the other hand, the higher boiling oil fractions and whole crude oil contain much more of the persistent, long-term poisons, including substances known to produce cancer.

I wish to point out that this is the first study where modern methods of oil analysis have been coordinated with a biological study of the long-term effect of an oil spill on the ecology and fisheries resources in a coastal area. It has been said that nine months after the Torrey Canyon accident "bottom samples revealed no trace of oil - microbial action and bottom currents had been fast and complete" (Eglington, 1969). However, this conclusion rests only on visual observation. Visually, oil is not evident at West Falmouth either; however, chemical analysis reveals its presence and the biological study measures its toxicity.

Now I wish to summarize our present knowledge of the aftermath of this accident.

Persistence and Spread of the Pollution.

Oil from the accident has been incorporated into the sediments of the tidal rivers and marshes and into the offshore sediments, down to 42 feet, the greatest water depth in the sea.

The #2 fuel oil involved in the spill is a relatively volatile oil product. In spite of this, volatilization has been minimal and the oil remains in the marshes, exposed to air, and in the offshore areas, 10 months after the accident.

The pollution has been spreading on the sea bottom and now covers at least 5000 acres offshore and 500 acres of marshes and tidal rivers. This is a much larger area than that affected immediately after the accident.

Bacterial degradation of the oil is slow; degradation is still negligible in the most heavily polluted areas and the more rapid degradation in outlying, less affected, areas has been reversed by the influx of less degraded oil from the more polluted regions.

The kill of bottom plants and animals has reduced the stability of marshland and sea bottom; increased erosion results and may be responsible for the spread of the pollution along the sea bottom.

Bacterial degradation first attacks the least toxic hydrocarbons. The hydrocarbons remaining in the sediments are now more toxic, on an equal weight basis, than immediately after the spill.

Oil has penetrated the marshes to a depth of at least 1-2 feet; bacterial degradation within the marsh sediment is still negligible eight months after the accident.

(From: Blumer, Sass and Souza, 1970; Blumer, Sass and Souza, unpublished results).

Biological Effects of the Pollution

Where oil can be detected in the sediments there has been a kill of animals; in the most polluted areas the kill has been almost total. Control stations outside the area contain normal, healthy bottom faunas.

The kill associated with the presence of oil is detected down to the maximum water depth in the area.

A massive, immediate kill occurred offshore during the first few days after the accident. Affected were a wide range of fish, shellfish, worms, crabs and other crustaceans and invertebrates. Bottom living fishes and lobsters were killed and washed up on the beaches. Trawls in 10 feet of water showed 95% of the animals dead and many still dying. The bottom sediments contained many dead clams, crustaceans and snails.

Fish, crabs, shellfish and many other animals were killed in the tidal Wild Harbor River; and in the most heavily polluted locations of the river almost no animals have survived.

The affected areas have not been repopulated, nine months after the accident.

Mussels that survived last year's spill as juveniles have developed almost no eggs and sperm.

(From: Hampson and Sanders, 1969; Sanders and Hampson, 1970; Sanders and Hampson, personal communication).

Effect on Commercial Shellfish Values

Oil from the spill was incorporated into oysters, scallops, soft-shell clams and quahaugs. As a result, the area had to be closed to the taking of shellfish.

The 1970 crop of shellfish is as heavily contaminated as was last year's crop. Closure will have to be maintained at least through this second year and will have to be extended to areas more distant from the spill than last year.

Oysters that were removed from the polluted area and that were maintained in clean water for as long as 6 months retained the oil without change in composition or quantity. Thus, once contaminated, shellfish cannot cleanse themselves of oil pollution.

The tidal Wild Harbor River, a productive shellfish area of about 22 acres, contains an estimated 4 tons of the fuel oil. This amount has destroyed the shellfish harvest for two years. The severe biological damage to the area and the slow rate of biodegradation of the oil suggest that the productivity will be ruined for a longer time.

The presence or absence of an "oily smell" is no clue for the presence of oil pollution in fish or shellfish. Only a small fraction of petroleum has a pronounced odor; this may be lost while the more harmful long-term poisons are retained. Boiling or frying may remove the odor but will not eliminate the toxicity.

(From: Blumer, Sass and Souza, 1970; Blumer, Sass and Souza, unpublished results).

TOXICITY OF OIL AND OIL PRODUCTS

The toxicity of crude oil and oil products and the danger of oil pollution to the marine ecology and to public health has been established in several independent ways. Oil and oil products contain many known poisons, e.g. fast acting compounds like the low boiling aromatic hydrocarbons and slowly acting but equally severe poisons like the high boiling aromatic hydrocarbons.

Laboratory studies on many marine animals have demonstrated the toxicity of oil and oil products.

Field studies have shown the disastrous effect of oil spills on marine organisms in their normal habitat.

From such investigations we know that all crude oils and all oil products, with the exception of some highly purified substances, are poisons for all marine organisms. Oil pollution can harm marine resources in many different ways: through direct or indirect kill, through destruction of the sensitive juvenile forms and through the depletion of food resources. The incorporation of sublethal amounts of oil leads to reduced resistance to stress and may result in failure to reproduce. Low level effects, which are still poorly understood, may interrupt any of the numerous events necessary for the feeding, migration and propagation of marine species and for the survival of those species which stand higher in the marine food web.

We need to comment on the problem of Petroleum and Cancer. Some years ago, a high incidence of skin cancer in some refinery personnel was observed. The cause was traced to prolonged skin contact by these persons with petroleum and with refinery products (Eckart, 1967). These incidents have demonstrated that oil and oil products can cause cancer in man, and these findings were supported by the isolation from petroleum of chemicals that are known to cause cancer and that were actually shown to induce cancer in test animals (Cook et al., 1958; Carruthers et al., 1967; Greaf and Winter, 1968).

Safeguards in plant operations protect the public from this hazard; however, when oil is spilled into the environment, we lose control over it and we should again be concerned about the possible public health hazard from cancer-causing chemicals in the oil. We have shown that marine organisms ingest and retain hydrocarbons to which they are exposed. These are transferred to and retained by predators. In this way even animals

that were not directly exposed to a spill can become polluted by eating contaminated animals. This and the presence of cancer-causing chemicals in oil pollution implies that the marketing and eating of fish and shellfish from polluted areas may constitute a public health hazard.

The toxicity of petroleum does not depend on its source; thus, all oils are poisons regardless of the field where they were produced and regardless of whether they are spilled from a tanker, a shore facility or from a submarine well or pipeline.

COUNTERMEASURES

Compared to the number and size of accidents and disasters the present countermeasures are inadequate. However, a rapidly advancing technology is hopeful of developing techniques that will be effective in dealing even with large spills under severe sea conditions. Yet, while we may remain hopeful that the gross esthetic damage from oil spills may be avoided sometime in the future, there is no reason to be hopeful that existing or planned countermeasures will reduce the biological impact of oil pollution.

The most immediately toxic fractions of oil and oil products are soluble in sea water; therefore, biological damage will occur at the very moment of the accident. Water currents will immediately spread the toxic plume of dissolved oil components and, if the accident occurs in inshore waters, the whole water column will be poisoned even if the bulk of the oil floats on the surface. The speed with which the oil dissolves is increased by agitation, and in storm conditions the oil will partly emulsify and will present a much larger surface area to the water; consequently, the toxic fraction will dissolve more rapidly and reach higher concentrations.

From the point of view of avoiding the immediate and long-term biological effect of oil spills, countermeasures are completely effective only if all of the oil is recovered immediately after the spill. The technology to achieve this goal does not exist.

Existing countermeasures differ in their effectiveness and desirability. I wish to advise strongly against the use of detergents, dispersants and sinking agents. Instead of removing the oil these measures push the oil into the marine environment. It will kill organisms in the water or on the sea bottom, and animals that survive the immediate impact can be

harmed by the long-term poisons which are present in petroleum. Sunken or dispersed oil can be taken up by fish and will destroy their food value because of the presence of substances poisonous to man (e.g. carcinogens).

For these reasons I feel that the use of dispersants and sinking agents is unacceptable, inshore or offshore, except under special circumstances, e.g. where danger to human life is involved.

Burning the oil through the addition of wicks or oxidants appears more attractive from the point of view of avoiding biological damage than dispersion and sinking. However, it will be effective only if burning can start immediately after a spill.

Containment and removal appear ideal from the point of avoiding biological damage. However, they can be effective only if applied immediately after the accident. Under severe weather conditions floating booms and barriers are ineffective. Booms were applied during the West Falmouth oil spill; however, the biological damage in the sealed-off harbors was severe and was caused probably by the oil which bypassed the booms in solution in sea water and in the form of wind-dispersed droplets.

THE PROBLEM OF WORLD WIDE OIL POLLUTION

Oil pollution is the almost inevitable consequence of our dependence on an oil-based technology. The use of a natural resource without losses is nearly impossible and environmental pollution occurs through intentional disposal or through inadvertent losses in production, transportation, refining and use. Large catastrophes like that of the Torrey Canyon, the blowouts at Santa Barbara and in the Gulf of Mexico get the attention of the public because of the obvious esthetic damage and the harm to birds. Small and continuing spills and their far greater impact on less visible resources are less apparent to the public. It is estimated that annually 10,000 pollution incidents occur in U. S. waters and that oil pollution accounts for 7,500 of these. We have estimated that the total influx of oil to the ocean per year amounts now to between two and ten million metric tons. Technology continues to expand, the sea transport of oil will increase and production will shift to the more hazardous locations in the Arctic and on the Continental Shelves. Losses will increase therefore even more rapidly than the oil production.

We know that oil is poisonous to all marine life and to man. In our study of the West Falmouth oil spill we have demonstrated for the first time the very severe and lasting impact of a spill on the ecology and fisheries resources. There is no doubt now that the annual influx of 2-10 million tons of oil into the ocean causes severe damage.

It is difficult to assess at this time how large this damage is. With the exception of our work in West Falmouth, no large-scale and long-time studies have been undertaken in which the present resources of chemistry and biology have been applied to understand the effect of oil spills. No public laboratory in this country is equipped at this time to determine whether fish or shellfish has become a hazard to human nutrition through the incorporation of toxic petroleum hydrocarbons.

The value of fisheries resources is still higher than that of the oil recovered from the sea. The importance of marine proteins for human nutrition demands that the damage to fisheries resources by oil pollution be considered in any cost analysis of marine oil production. It is disappointing that these real costs and values have been disregarded in all planning for the extension of marine oil production, oil transport and port design. A similarly one-sided approach would be, for instance, a demand by fisheries concerns that all marine oil production and shipping be terminated, since it clearly interferes with fisheries interests.

We have to start to realize that we are paying for the damage to the environment, especially if the damage is as tangible as that of oil pollution to fisheries resources and to recreation. Experience has shown that cleaning up a polluted aquatic environment is much more expensive than it would have been to keep the environment clean from the beginning. In terms of minimizing the environmental damage, spill prevention will produce far greater returns than cleanup.

Finally, I wish to point out that it is not sufficient to consider the effect of oil pollution without also considering the other stresses on the productive regions of the ocean.

The combined impact of oil and oil products, chemicals, domestic sewage and municipal wastes, of the filling of wetlands, of dredging and of overfishing might lead to a deterioration of the sea similar to that which we have brought about in the Great Lakes. Because of the much longer time scale of the oceans, such a catastrophic deterioration would not likely be reversed within many generations; it would have a deep and lasting impact on the future of mankind.

RECOMMENDATIONS

1. Oil and oil products must be recognized as poisons that damage the marine ecology. Fisheries resources are destroyed through direct kill, through sublethal damage and through the elimination of food sources. Oil is poisonous to man and polluted fisheries products are a public health hazard.

2. All precautions must be taken to prevent oil spills. Preventive measures must be aimed at eliminating human error, at the present the principal cause of oil spills.

3. Spill prevention must be backed by effective surveillance and law enforcement. In terms of cost effectiveness spill prevention is far superior to cleanup.

4. The conservation practiced in oil production has been aimed primarily at preserving the oil reserves in our oil reservoirs. Oil production, transportation and refining have largely disregarded the need to conserve the environment and to maintain our recreational and fisheries resources. Conservation must now be aimed at preserving the environment. Optimum use must be made of our oil reserves at minimum cost to the environment.

5. The hazard in offshore drilling increases with the number of wells being drilled, the number and length of pipelines, and the number and size of marine storage facilities. These parameters should be minimized to reduce the environmental hazard.

6. In the granting of offshore leases consideration must be made of the ecological hazards and of the danger to fisheries resources.

7. Ecological damage and damage to fisheries resources is a direct consequence of oil spills. At the present time all of us are paying the direct and indirect cost of this damage. In future offshore leases a certain percentage of the revenue should be allocated for environmental protection.

8. Environmental protection funds derived from offshore oil leases should be used to accomplish these tasks:

- a) Ecological and chemical survey of the area before drilling is started.
- b) Ecological and chemical survey, continued during the period of production.

- c) Establishment and funding of laboratories to carry out continuous chemical and biological surveys.
- d) Research on the effects of oil pollution on the marine ecology, on fisheries resources and on public health.
- e) Research on realistic countermeasures that will recover spilled oil or render it harmless in situ, not measures that introduce the oil into the environment at undiminished toxicity.
- f) Training and education in marine ecology and in the pollution field.

9. Present federal funding in the area of marine pollution is insufficient and the granting process is cumbersome. Research funds have to be renegotiated annually with complete restatement of the goals. Proposal writing and frequent interim reporting require a large fraction of the time that should be devoted to the research. The funding level should be increased, research with long-term goals should be funded for three to five year terms and the administrative load on the investigator should be reduced at least to the level that now satisfies the National Science Foundation.

10. Oil and oil products in all forms are equally dangerous. Thus, whether the oil is derived from a well or from a tanker or from any other source does not affect its environmental toxicity. In drilling operations oil is commonly used as the base of drilling muds. When spilled or disposed into the ocean, an oil based-drilling mud will damage marine life and fisheries resources in the same manner as an oil spill. Therefore, oil-based drilling muds used at sea must be contained and their disposal must be prohibited.

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Dr. Blumer was born in Switzerland and received his education at the University of Basel, Switzerland (Ph.D. 1949). He became a U. S. citizen in 1964. He has been associated with industry (CIBA, Limited, and Shell Development Company) and with academic institutions (University of Minnesota, Scripps Institution of Oceanography). He has been at the Woods Hole Oceanographic Institution since 1959.

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Dr. Blumer is author of numerous scientific papers. His research interests and experience lie in the field of organic geochemistry, chemical oceanography and oil pollution. He has worked on the origin of petroleum, the chemical analysis of petroleum, the origin and the long term fate of organic compounds, especially hydrocarbons, in the sea and in the marine food chain.

Dr. Blumer acknowledges long term support of his work in these areas by the Office of Naval Research, by the National Science Foundation and by the Federal Water Quality Administration.

R. Moore

Also, his article on oil pollution in the marine environment.

[The above-mentioned article follows.]

Also the statement of John M. Hunt, Chairman of the Department of Chemistry, Woods Hole Oceanographic Institution before the Antitrust and Monopoly Subcommittee.

[The above-mentioned statement follows.]

Also the testimony of Howard Sanders before the Conservation and National Resources Subcommittee on Government Operations.

[The above-mentioned testimony follows.]

OIL POLLUTION IN THE MARINE ENVIRONMENT

by

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During recent years the offshore production of oil and gas and the shipment of petroleum by tankers has grown at a fantastic rate. The amount of oil carried by tankers at sea today is 15 times greater than it was thirty years ago. Also in these thirty years our production of offshore petroleum has increased from about a million tons to over four hundred million tons annually. This vast increase in both the production and transportation of petroleum has been accompanied by a marked increase in oil pollution of the marine environment. Since many oil constituents are toxic to practically all forms of marine life the repeated spillage of oil has become a serious hazard to the marine ecology and to the vitality of our fishing industries. In addition, damage to coastal recreational areas throughout the world is increasing every year even though the newspapers only report on the major oil spills.

Just how much damage is this oil doing to the marine environment? How serious is oil pollution to marine life and to man? Today I hope to show you that the problem is more serious than we had previously thought. Oil pollution is not something that goes away after the last of the oil has been cleaned off the surface of the beach or the last dead birds and fishes have been carried away. The oil can enter the marine food chain and end up in food we eat from the sea. In addition, we have evidence that oil can enter the sediments beneath the sea. It can last in the sediments for a long time after all surface traces of visual oil have disappeared. As such, oil can bring about widespread and persistent damage to all benthic (bottom) organisms.

Before describing our studies, I would like to look at the problem of oil pollution on a worldwide basis. There are over 100 nations on earth with coastlines on the sea. These range from a few kilometers to over 25,000 kilometers. From the inter-tidal zone of the world's coastlines out to water depths of 350 meters there are approximately fifteen million square kilometers of potential oil provinces. Almost every month we hear of new discoveries such as the major oil discovery recently made off the Norwegian coast. It has been estimated that

the offshore basins of the world contain reserves of 220 billion metric tons of oil, or oil equivalent.

Petroleum geologists now estimate that by 1975 we will be drilling in 1,000 meters of water. Last year the Deep Sea Drilling Project supported by the National Science Foundation of the United States of America found evidence of oil in the Gulf of Mexico at a water depth of about 4,000 meters. A few months ago this same project developed a technique for re-entering a drilling hole under 3,000 meters of water. This means that wells can be drilled and completed in vast areas of the ocean far beyond our continental shelves. It also means that the production of offshore oil may some day exceed that produced on land.

There is no question that we need this oil. It is estimated that twenty years from now the world consumption of oil will be four times that of today and the use of gas may increase as much as five times. Furthermore, much of this oil and gas must be hauled by tanker over long distances to consumer areas. For example, both Europe and Japan receive over 85% of their oil from the Middle East and North Africa.

In Table I I have listed the estimated offshore world petroleum production for 1970 and 1980 and the amount that will be carried by tankers during these years. Total world production for 1970 will be about 2,200 million tons. Only 20% of this, or 440 million tons, is produced offshore, but 70% of the total or 1,500 million tons will be carried by tanker. Tanker cargoes will probably double by 1980, while the offshore production figures will triple.

Clearly this rise in offshore production and transportation will be accompanied by a rise in pollution. I am sure that many of you can cite examples from the area where you live or from areas at sea where you have done research. Our Oceanographic Institution is located on Cape Cod in the northeastern part of the United States. Each year we have had increasing incidents of oil slicks contaminating the beaches of our area. Just this past summer we had nine separate incidents of oil pollution on the Cape and nearby islands. Our oceanographic research vessels have had plankton nets fouled at sea due to the increasing build-up of asphalt and tar balls in the open ocean. My friends from Europe tell me that the Canary Islands off the coast of Spain are now a refueling station for the tankers going around Africa. Many of the once beautiful beaches are now covered with oil or oil slicks.

Just what is the source of all this oil pollution entering the sea and what is the level of chronic contamination? We have made some estimates based on the existing literature and the results are shown in Table II. After a tanker has unloaded its oil the walls of the oil compartments are covered with a film of oil which must eventually be replaced with a water ballast. In the early sixties this oil was simply washed down and disposed at sea. It has been estimated that 0.4% of each oil cargo is lost in this manner. In 1967, the potential oil pollution by tanker washing at sea was about three million tons. However, since the development of the new Load-On-Top system, which enables compartments to be washed internally, this dumping has been considerably reduced. Unfortunately, however, somewhere between 20 and 50% of the tankers at sea do not have this system on their tankers, or do not use it. This fact, combined with the great increase in the oil carried at sea has not appreciably reduced annual cargo wash pollution. The 1.5 million tons shown in Table II will result if only 20% of the tankers dump their tank washings at sea. We estimate that three million tons will result if the L.O.T. technique is not fully effective on the remaining tankers.

A second source of pollution comes from the 45,000 ships in the world other than tankers. They pump oil from their bilges. This results in an estimated addition to the oceans of half a million tons of oil per year.

Accidental tanker spills are more difficult to assess, but it has been estimated that there probably are around 15,000 spills per year on a worldwide basis, most of these occurring in coastal waters, and port areas. The estimates shown represent a range of about 0.1% of the annual oil in transport. This figure is probably conservative since it counts only the accidental spills. There have been many incidents where cargo ships have deliberately pumped oil in order to enable them to enter a shallow port.

The figures for oil drilling also are probably on the low side. In the Caspian Sea alone the Russians have reported oil pollution to amount to a million tons annually. In some parts of the world unused condensate has been run directly from producing wells into rivers entering the sea because of a lack of suitable pipeline facilities. Sewage and industrial outfalls are another source of pollution which probably runs a million tons a year from the United States alone.

You can understand how serious this problem is when you consider that in all of World War II the total amount of oil lost by tankers at sea was about the same as the amount we are putting into the sea every year today - 5 to 10 million tons.

I have listed the amount of natural hydrocarbons produced by living things to show that it is small compared to the oil pollution. Furthermore, the natural hydrocarbons are non-toxic and uniformly spread over the ocean, whereas most of the oil fractions are toxic to marine life and are spilled in larger amounts in the most productive marine areas. I would now like to show the results of this toxicity in an oil spill that occurred near our laboratory.

On September 16, 1969 a barge (Fig. 1) loaded with #2 fuel oil ran up on submerged rocks near Falmouth, Massachusetts spilling 600 tons of oil into the water. The spillage occurred at the point marked "x" in Figure 2. The oil was driven mostly north-northeast so it covered almost the entire area of Wild Harbor to the north along with part of the West Falmouth harbor and the coastline in between.

Figure 3 shows an aerial photograph of the area including Wild Harbor river which was heavily polluted. Figures 4 and 5 show the polluted coastline. The brown-coffee color is due to an emulsion of oil and water. The day after the accident the shoreline was littered with almost continuous windrows of dead and dying fish and marine invertebrates as shown in Figures 6,7 and 8. It was clearly evident that a massive and immediate kill had occurred of organisms belonging to the entire spectrum of animal life in the area. This included more than 200 species of fish, various crabs and clams, lobsters, and numerous kinds of worms, etc. From the composition of the dead bodies littering the beach it was obvious that mortality was occurring sub-tidally, that is, where sediments are always covered by water as well as inter-tidally, that is, in the sediments between high and low water. Our scientists immediately established a series of stations throughout the area as shown in Figure 9. The horizontal distance between the vertical lines shown is about 3.6 km. In contrast to previous studies that concentrated on the birds and surface organisms, this program emphasized the impact of oil on the bottom creatures. In a dredge sample (Fig. 10) taken under 10 feet of water, Dr. Sanders of W.H.O.I. found 1,552 dead organisms belonging to 55 species with only 103 organisms alive. Over much of Wild Harbor it appeared that over 90% of the bottom organisms were killed within the first few days.

Figure 11 shows the numbers of dead fish from about 500 meters of beach. Both adult and young specimens were involved. The pollution covered not only Wild Harbor but it also spread up the river leading from the harbor as shown in Figure 12.

The effects of the pollution persisted for many weeks after the accident.

Nematodes from bottom samples were almost totally destroyed in the first month as shown in Figure 13. In the small distributaries such as Marsh Creek feeding into Wild Harbor the smallest clams and amphipods were completely wiped out by December (Fig. 14). Rather interestingly, while there was a high mortality among most forms of life, one small polychaete worm *Capitella*, known as a pollution indicator increased explosively several months after the accident as shown in Figure 15. This organism cannot proliferate in a normal environment since it has little protection against its predators. However, when everything else is dead *Capitella* begins to increase since it is much more resistant to stresses on the environment than the average marine organism.

Possibly one of the most unexpected results of this study was the finding that the oil moved through the sand and eventually polluted a much larger area than at the beginning. For example, as shown in Figure 16, at the end of September the spill had been confined largely to the area east of the dotted line shown on this map. Three months later it had spread a distance of nearly $3\frac{1}{2}$ kms. from shore to the dotted line shown on the left. Stations 35 and 37 which had been clean with a normal environment shortly after the spill, later became polluted with oil and a large mortality of the bottom organisms occurred. As far as we know this is the first time a pollution study has reported that oil can spread through the sediments long distances from shore. We found bottom organisms killed at all depths down to the maximum of about 14 meters. The tragedy was not only in killing the bottom creatures, but also this wiped out the major source of food for many bottom feeding fishes throughout the polluted area. Surviving organisms that were found on the edge of the polluted zone were also affected and many were unable to reproduce.

I would now like to turn to the chemical studies, carried out primarily by Dr. Blumer at Woods Hole. Figure 17 shows the chlorophyll structure with which many of you are familiar. The branched hydrocarbon chain shown in yellow is the source of a natural hydrocarbon formed biogenetically. It differs markedly from many of the constituents in crude oil in that it is non-toxic. Consequently, it can pass through the food chain without damage to the organisms.

Crude oil contains low boiling saturated hydrocarbons such as shown in Figure 19 which are relatively soluble in sea-water and at low concentrations they produce both anaesthesia and narcosis in a wide variety of lower animals. They are especially damaging to the young forms of marine life. At high concentrations they will cause both cell damage and death. Figure 20 shows some of the most toxic components of

crude oil namely the low boiling aromatic hydrocarbons. Benzene, toluene, and the xylenes are acute poisons for man as well as for other organisms. Some of the higher hydrocarbons such as naphthalene and phenanthrene are even more toxic to fishes. In addition to the toxic hydrocarbons there are many high boiling aromatic hydrocarbons in crude oil which are known to be carcinogenic. This includes a wide range of 4 and 5 ring aromatic hydrocarbons.

Figure 21 shows a gas chromatograph of the #2 fuel oil that caused the widespread damage. The peaks represent the normal (straight chain) paraffin hydrocarbons. The large broad band shown here represents the cyclic compounds. This contains many of the multi-ring aromatic hydrocarbons. The small dot shows the position of the C_{17} normal paraffin with the shoulder representing pristane which comes from the hydrolysis and oxidation of the hydrocarbon chain on chlorophyll. We can use these adjoining peaks in comparing the bacterial degradation of the oil in the sediments since the bacteria will attack the normal paraffins such as C_{17} but will not readily attack pristane.

Figure 22 shows the chromatogram of oil extracted from the sediments in Wild Harbor at station 31 one month after the accident. You will note that the area on this curve occupied by the toxic aromatic and naphthenic fractions is larger than on the original fuel oil curve mainly because the lighter paraffin fractions at this end have been lost partly in solution. Now on succeeding slides we are going to observe the effect of bacterial degradation in the normal environment on the paraffin fraction shown as the peaks of this #2 fuel oil. First to show you what to look for I refer to two slides Figures 23 and 24 in a paper by Miget et al. These represent the degradation of oil in sea-water by bacteria over 48 hours under ideal conditions in a laboratory. You will note the marked decrease in straight chain paraffins due to microbial oxidation. The organisms, however, were unable to act on the aromatic naphthenic fractions. This means that in a normal environment it is the aromatic hydrocarbons that become concentrated and are free to pass through the marine food chain eventually to shellfish eaten by man. What has been demonstrated in the laboratory with micro-organisms also occurs in the natural environment as in the West Falmouth oil spill, however, the latter takes a much longer time.

Figure 25 shows a chromatogram of the oil and sediments at Wild Harbor in November, 1969 three months after the spill. There is very little visible change in the normal paraffin content or in the ratio of C_{17} the higher peak, to pristane.

By December (Fig. 26) there has been a marked decrease in the normal paraffins which can be seen most readily from the lower ratio of the C_{17} to pristane.

We were unable to obtain additional samples in January and February due to ice in the area, however, the March sample (Fig. 27) showed a marked increase both in the total hydrocarbon content and in a return of the normal paraffins to near their original level. This meant that some less degraded fuel oil from the original spill had entered the area from the sediments in another part of the harbor and has masked the effect of the microbial destruction of the normal hydrocarbons. The results of this unexpected influx of oil in the sediments are most clearly seen in Table 3. Here the oil concentration is listed in the sediments in parts per million going from station 31 closest to shore to station 35 over 3 kilometers from shore. You will note that in the first three stations which extend out about a kilometer and a half from shore, the oil content was stabilized between October and December, but it took another jump between December and March. This jump was accompanied by increased pollution at the far out stations 37 and 35. These stations were not previously analyzed because we did not realize that the oil would spread such a great distance from shore through the sediments. Figure 28 shows the oil in the sediments at station 31 in April of this year. By June, as shown in Figure 29, the bacteria were fairly successful in eliminating most of the normal paraffin hydrocarbons and in reducing the ratio of C_{17} to pristane to about 1 to 1. This oil of course is now more toxic and contains a higher concentration of the aromatic hydrocarbons than the previous oil which contained a larger amount of the relatively non-toxic normal paraffins.

In summarizing the analytical work of this oil spill I would like to make the following points:-

(1) Oil spills do have the capability of entering the sediments well beyond the inter-tidal zone. The shifting of oil in the sub-sea sediments especially if they are anaerobic may occur for a very long time since the oil is not subject to oxidation as it would be at the surface.

(2) Oil contains a wide spectrum of poisons to marine life. The low boiling hydrocarbons are relatively soluble and can produce anaesthesia, narcosis and death to a wide variety of lower animals. The low boiling aromatic hydrocarbons are acute poisons for man and many other organisms. Some high boiling aromatics are carcinogenic. The kill of bottom fauna from oil pollution can be wide-spread

and can extend to unpolluted areas as the oil moves through the sediments.

(3) Bacterial degradation of oil in the sediments destroys the non-toxic heavy hydrocarbons and leaves behind the aromatic hydrocarbons including the carcinogens which then can enter the food chain as they are picked up by organisms. In the West Falmouth harbor which was also contaminated by this spill the scallops that survived took up oil in their body fat and these hydrocarbons are still present in shellfish ten months after the accident. No detoxification occurs if the scallops are transplanted to clean water. Human consumption of such contaminated shellfish therefore constitutes a serious health hazard.

Now what kind of counter measures should we take to avoid pollution? From the point of view of avoiding immediate and long-term biological effects of oil spills counter measures are effective only if the oil is recovered shortly after the spill. The technology to achieve this goal does not exist now.

Other counter measures differ in their effectiveness and desirability. Figure 30 lists various methods which have been used by coastal authorities to clean up spills. Containment and removal by the use of buoys, specially equipped ships and rubber oil containers that can be flown to the site are still the best method for cleaning up an oil spill. Several products are also on the market for carrying out controlled burning of oil at the surface. With most of these products, the burning can be contained in localized areas so that no hazard is involved to personnel and ships that are on the scene. Much less desirable is the use of dispersants and sinking agents. Both of these which are widely used by some countries of Europe simply result in forcing greater amounts of oil into the environment. Dispersants break the oil up so that it becomes more readily assimilated by surface, mid-water and bottom organisms. Sinking agents force the oil to the bottom where there is very little oxygen and the oil then has an opportunity to penetrate the sediments, kill the benthic organisms and persist for a very long time.

In conclusion, I want to emphasize that the whole matter of oil pollution is not being taken seriously in the area where it is doing the greatest damage. It is true that a small spill now and then may represent only a nuisance value and the environment may quickly recover. But we have moved beyond the era of small spills into an era where we are dumping annually as much oil into the sea as was lost in all of World War II. How much stress of this kind can the coastal and open marine ecology take before it gradually begins to break down? Already we know that there are many areas where the shellfish have been polluted with oil for so long that the

people are used to the tainted smell and taste. There is no one to tell them that the harmless fractions of the oil have been consumed by bacteria and what they are eating contains the residual aromatics including the carcinogenic hydrocarbons. We need now to set up more strict conservation and spill prevention practices in all oil ports around the world. Furthermore, ecological studies should be made by all nations on a continuing basis to monitor the environment and to determine to what extent oil pollution is becoming chronic. The Load-On-Top method of washing tanker compartments is a promising interim measure to reduce marine oil pollution. Eventually it must be replaced by clean ballasting techniques. The ocean is large and can take a certain amount of oil pollution but already warning signs are beginning to appear that vast areas of the ocean are being covered by the residues of oil spillage. Unless steps are taken to reverse this upward trend of oil pollution we can expect to see a gradual increase in oil pollution of our food from the sea as well as a decrease in the marine productivity.

TABLE 1
FORECAST OF OFFSHORE WORLD PETROLEUM
PRODUCTION AND TRANSPORTATION

(in million metric tons)

PRODUCTION(total)	2,200	4,000
PRODUCTION(offshore)	440	1,300
TANKER CARGOES	1,500	2,900
PETROLEUM RESERVES	15,000	?*

* Ultimate world potential offshore to depths
of 350 m is estimated at 220×10^9 metric tons.

TABLE II

ANNUAL SOURCES OF OIL POLLUTION IN THE SEA

	<u>Million Metric Tons</u>
Washing of oil cargo tanks	1.5 - 3
Bilge pumping (45,000 ships)	0.5 - 0.5
Tanker spills (15,000/year)	1 - 2
Oil drilling, pipeline and offshore storage tank spills ($>20,000$ wells)	1 - 3
Sewage and industrial outfalls	1 - 1.5
TOTAL	<u>5 10</u>
Natural hydrocarbons produced	1

TABLE III

OIL IN BOTTOM SEDIMENTS
BUZZARDS BAY, MASSACHUSETTS, U.S.A.
(in parts per million of dry sediment)

<u>MONTH</u>	<u>S T A T I O N S*</u>				
	<u>31</u>	<u>7</u>	<u>20</u>	<u>37</u>	<u>35</u>
SEPTEMBER	554	69	39	--	--
OCTOBER	1,110	187	44	--	--
NOVEMBER	1,110	143	24	40	--
DECEMBER	1,113	119	45	--	60
MARCH	12,390	--	--	35	--
APRIL	4,470	982	62	59	--

* Water depth 1 meter for 31 to 10 meters for 35 (3 km. from shore)

TABLE IVCONTROL OF OIL SPILLS

1. CONTAINMENT AND REMOVAL
2. CONTROLLED BURNING
3. DISPERSANTS*
4. SINKING AGENTS*

* Hazardous to marine life because they force oil into the environment.

STATEMENT OF JOHN M. HUNT
CHAIRMAN OF DEPARTMENT OF CHEMISTRY
WOODS HOLE OCEANOGRAPHIC INSTITUTION
WOODS HOLE, MASS., 02543
BEFORE THE ANTITRUST AND MONOPOLY SUBCOMMITTEE
UNITED STATES SENATE - WASHINGTON, D.C.
AUGUST 12, 1970

Mr. Chairman and Members of the Subcommittee: I appreciate this opportunity to testify on the problem of oil pollution in the marine environment. I would like to summarize the most important points which I will bring out in my statement. These are as follows:-

(1) During recent years the offshore production of oil and gas and the shipment of petroleum by tankers has grown at a fantastic rate. By the end of this decade it is expected that one-third of the world's oil production will be in coastal offshore areas and by the mid 1980's, the figure will be one-half.

(2) This vast increase in both the production and transportation of petroleum will undoubtedly be accompanied by an increase in oil pollution of the marine environment. Since many oil constituents are toxic to practically all forms of marine life, the potential spillage constitutes a serious hazard to the vitality of our commercial and sport fishing industries. In addition, damage to coastal recreational areas is increasing every year even though wide spread publicity is given to only the major spills.

(3) If we are to preserve our fishing industry and recreational areas we need to take steps now to reverse the upward trend of oil pollution until we have better technology on cleanup and control of oil spills, and until we have more research data on the effects of oil on the marine environment. Research is badly needed on the conditions of the environment before and after

-2-

pollution. A certain percentage of the income from offshore oil should be used to support such research.

Over one hundred nations in this world have coastlines on the seas. These range from a few miles to over twenty thousand miles. Going out from these coastlines to water depths of 1,000 feet, there are approximately six million square miles of potential oil provinces. Almost every month we hear of new discoveries such as the major oil discovery recently made off the Norwegian coast. It has been estimated that the offshore basins of the world will ultimately produce as much as 1,600,000,000,000 barrels of oil or oil equivalent (1)*. This oil is only from water depths out to 1,000 feet.

Last year, the Deep Sea Drilling Project supported by the National Science Foundation found evidence of oil in the Gulf of Mexico at a water depth of about 12,000 feet. During the past few weeks this same Project made a major technological breakthrough in drilling. It developed a technique to re-enter a drilling hole under 10,000 feet of water. This means that wells can be drilled and completed in vast areas of the ocean far beyond our continental shelves. It also means that the production of offshore oil may someday exceed that produced on land.

There is no question that we need this oil. It is estimated that twenty years from now world consumption of oil will be four times that of today and that the use of gas may increase as much as five times (1). Furthermore, we need oil from friendly countries close to consumer areas. Europe receives 85% of its oil from the Middle East and North Africa. In the last three years

* See References

-3-

since the closing of the Suez Canal, tanker freight rates from the Persian Gulf to the U.S. East Coast have jumped from 52¢/bbl to \$3.30/bbl.

The question is - how do we reconcile the need for increased oil production from our own coastline with the potential hazard to our fishing and recreational industries?

It is clear that the rise in offshore production and transportation is being accompanied by a rise in pollution. Dr. Blumer of W.H.O.I. now estimates that between five and ten million tons of oil are entering the marine environment annually. I would like to mention a few examples of the effects of this oil other than those mentioned by the previous witnesses.

I have lived on Cape Cod for nearly seven years and each year I have noticed increasing reports in the local papers of oil slicks contaminating the beaches of the Cape, Martha's Vineyard and Nantucket Island. Just this summer with our beaches already overcrowded, we have had nine separate instances of oil pollution on the Cape and Islands. In one case the Woods Hole ferry dumped oil in the harbor by our laboratory during fueling operations. Most of the oil on the islands, however, has an unknown source and with hundreds of tankers of foreign flags on the open seas there is really no simple way to control spillage or dumping beyond the territorial waters of the United States.

A more serious example of chronic oil pollution awaits those of you who may have an opportunity to visit the Canary Islands. These islands off the northwest coast of Africa were once the pleasure spot for many Europeans who were seeking a quiet vacation along beautiful beaches such as once existed near the capital of Las Palmas. Since the Suez Canal was closed

-4-

there has been a steady stream of oil tankers moving along the coast of Africa toward the refueling station in the Canary Islands prior to their trip to European ports. Today there is not a single beach on the main island that is not covered with oil or oil slicks. The whole area smells of petroleum and the tourists have long since vanished. In this case, of course, the Spanish government made more money from the tankers than from the tourists so economics justified the destruction of the beaches.

The third example I want to cite is the pollution of the Caspian Sea recently reported by the Russians (2). Back in 1962, I was fortunate in being a member of a group of petroleum scientists permitted to visit oil fields in the Soviet Union. During this trip we visited the largest offshore oil province in the Caspian Sea. This was a small city built on pilings with nearby oil rigs drilling at water depths from ten to one hundred meters. I was impressed by the extent of their offshore operation but I also noticed that they took no particular precautions regarding oil pollution. The sea itself looked relatively unpolluted and at the local hotel we were fed excellent orange and black caviar.

The picture today in the western Caspian Sea after a decade of offshore production is quite different. Soviet scientists have estimated that about one million tons of petroleum and petroleum products enter the Caspian Sea annually, mostly on the western side. Since the Caspian is an enclosed Sea, this pollution has built up to a higher concentration than would be expected in the open ocean. Catches of fish in the Caspian Sea have decreased markedly during the last ten years and this caused the Soviets to take a closer look at what was going on. They made a survey of the total quantity of phytoplankton,

-5-

which is the primary food for all marine life, in the western part of the Southern Caspian Sea. The results showed that the quantity of plankton had decreased from 8.7 grams/meter³ in June 1962 to 2.1 grams/meter³ in June 1969. The amounts of nitrogen, phosphorous and silicon which are utilized for growth of the phytoplankton were found to be the same in the polluted areas as in the non-polluted areas. Production of phytoplankton was six to ten times greater in the unpolluted areas despite the presence of the same nutrients in both areas. Their obvious conclusion was that the oil had greatly reduced phytoplankton production, which in turn was reducing the fish population.

I would like the Subcommittee now to turn to the figure at the end of my statement which shows the fishing grounds of the North Atlantic. On the continental shelf of this area between the U.S. Border and Cape Hatteras there was about 1.6 billion pounds of fish landed in 1968. About one-third of this was shellfish. It has been estimated that this could be doubled by utilizing unused fishery resources. This area also supports a major coastal recreational industry and in the northern areas there are many relatively unpolluted coastal shorelines which have not felt the contamination from large urban populations. This area also contains, as shown by the shading, a potentially valuable offshore oil province, close to one of the highest consumer areas in the world. The potential threat of pollution is serious since oil drilled as far as 120 miles offshore may find its way to the Atlantic Coast of the United States. Surface currents in these areas have been measured in detail by Woods Hole scientists and are shown by arrows in this figure for Summer and Autumn. You will note that some shoreward

movement occurs as far as 120 miles offshore. With such conditions it is obvious that laws limiting the liability to spills within three miles offshore only cover about three percent of the actual spillage area that can lead to coastal damage.

In conclusion, I would like to make the following recommendations regarding offshore leasing and regulation of our future offshore oil fields and coastal refineries.

(1) In the immediate future there should be an effort to increase oil production from existing offshore wells providing this does not reduce the total amount of oil that can be recovered from the fields by primary and secondary recovery methods. Preference should be given to issuing permits for future drilling in areas where wells already exist or leases are already held by oil companies.

(2) We should be slow to open up rank wildcat areas particularly in the prime fishing and recreational areas until better techniques exist for combatting oil spills. Research and development to combat oil spills is in its infancy and it is seriously handicapped by a lack of basic knowledge on the effect of oil on the environment.

(3) A certain percentage of the income from offshore production should be set-aside for the support of research as follows:-

(a) We need research teams composed of at least one Ph.D level marine ecologist trained in bottom dwelling (benthic) organisms, a Ph.D organic chemist, and two or three assistants for each major area being opened for exploration. These teams should study a coastal area before offshore drilling commences. They should be

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available for on-site studies whenever a major oil spill occurs, and they should periodically study the effects of unknown source oil slicks moving in from the open ocean.

(b) Long term, 3 to 5 year research grants should be made to support such teams. The tragedy in research today is that nearly all government funding agencies, except the National Science Foundation, support on a one year basis and require excessive paperwork to justify a program.

We had no directly authorized funds to study the West Falmouth oil spill and it would have taken at least 6 months to a year to get any. By then it would have been too late to get the important early data.

(c) The oil industry is working to develop improved methods of containing and destroying oil spills. However, funds should also be available for such research by universities and private oceanographic institutions who have a broader understanding of the effects of these techniques on the marine environment.

The amount of money spent on research and oil pollution in the past has been trivial and yet the problem of oil pollution can only get worse. What we really need is a crash program on research comparable to that which has been used on space and some military programs. Research personnel are

-8-

available due to cutbacks in other areas but we desperately need the funds for laboratories and instruments to do the job.

My comments have been aimed primarily at offshore production but I also feel that the transportation industry should make some contribution to a better understanding of the oil pollution problem. It really scares me to hear that the Japanese have started construction of a tanker which will hold three million barrels of oil. This is about five times the amount spilled by the Torrey Canyon. Imagine what such a spill would do to our New England coast. I also think it is particularly unfair that international ship owners flying flags of convenience are amassing tremendous wealth at the expense of the U.S. consumer (3). These tankers pollute the world's oceans at will and they contribute nothing to the problem of solving oil pollution. I think it is time that Congress took a hard look at the tanker business with a view toward exerting some control over those tankers entering American ports. To a large extent I think the tankers of major oil companies of the United States have made an honest effort to minimize oil spills. The same thing cannot be said of the international billionaire ship owners.

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John M. Hunt, Chairman
Department of Chemistry
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts 02543

Dr. Hunt was born in Cleveland, Ohio and received his education from Case-Western Reserve University and Pennsylvania State University (Ph.D., 1946). He spent fifteen years in the exploration research laboratory of Standard Oil of New Jersey in Tulsa, Oklahoma, where he eventually became Head of the Geochemistry Research Section. In 1964 he joined the Woods Hole Oceanographic Institution as Chairman of the Department of Chemistry.

Dr. Hunt has served on research committees of the American Petroleum Institute and is a past Chairman of the Organic Geochemistry Group of the Geochemical Society. He has been active in the American Chemical Society, Geological Society of America, American Geological Institute, American Association for the Advancement of Science, and the American Association of Petroleum Geologists. He is currently an Associate Editor of the Bulletin of the American Association of Petroleum Geologists and is a Lecturer on their Continuing Education Committee. He has published numerous papers in the field of organic geochemistry, and his current interests extend through all phases of chemical oceanography.

Dr. Hunt acknowledges long-term support of the work in his department by the National Science Foundation, the Atomic Energy Commission and the Office of Naval Research.

TESTIMONY OF HOWARD SANDERS
BEFORE THE CONSERVATION AND NATURAL RESOURCES SUBCOMMITTEE
COMMITTEE ON GOVERNMENT OPERATIONS

Washington, D. C. July 22, 1970

On the morning of September 16, 1969 the barge FLORIDA belonging to the Northeast Petroleum Company with a cargo of 625,000 gallons of No. 2 fuel oil came ashore at Fassett's Point off West Falmouth, Massachusetts, and about 170,000 gallons of oil were lost into the water. Strong SSW winds moved the oil NNE so that much of it was carried into Wild Harbor and the Wild Harbor River areas of North Falmouth.

On September 17 and 18 the waters of Wild Harbor were a brown coffee-colored emulsion and the shoreline was littered with almost continuous windrows of dead and dying fish and marine invertebrates. It was clearly evident that we were viewing a massive and immediate kill of at least the larger and therefore more obvious organisms belonging to the entire spectrum of animal life found in the area (more than 20 species of fish, various crabs and clams, lobsters, and numerous kinds of polychaete worms, etc.). From the animals composing the dead bodies littering the beach, it was obvious that mortality was occurring subtidally (where sediments are always covered by water) as well as intertidally (sediments between high and low water marks that are periodically exposed).

We immediately established a series of intertidal stations along the axis of Wild Harbor River to assay these effects and to document the patterns of change that might occur with time. Subtidally, we occupied a grid of stations in Wild Harbor and the neighboring areas of Buzzards Bay to gain some understanding of the impact of the oil on the subtidal benthic fauna.

One of our first bottom samples was taken off Wild Harbor Beach in ten feet of water on September 19. The sample yielded 106 living invertebrates belonging to 28 species. Although alive, many of these animals were moribund and in the process of dying. In contrast, there were 1573 dead specimens in the same sample belonging to 55 species. In other words, there already was a 93% mortality at this locality.

When the same site was next sampled on September 27, the living component of the population was further reduced to 75 individuals composing 27 species while the dead component was dramatically smaller, only 150 specimens

belonging to 29 species. These findings indicate that in the short period of eight days, the carcasses of the great majority of animals lacking hard parts rot and decompose so that no remnants of their presence remain.

Such an interpretation is corroborated by intertidal observations. On September 19 the tide pools along Wild Harbor River were literally filled with dead and decaying or moribund bodies of polychaete worms, clams, other invertebrates, and some fish. A week later, only the shells of clams and snails were still present. Thus, there would be little evidence for the massive mortality if the survey were carried out more than ten days after the oil spill.

Our general findings are as follows:

(1) Whenever oil can be detected in the subtidal sediment samples, there is some mortality in the associated biological sample -- the larger the concentration of oil, the greater the mortality. In some samples that were strongly saturated with oil, the kill has been almost total.

(2) Certain forms, such as amphipod crustaceans, are highly susceptible while others, i.e., nematodes, are relatively resistant.

(3) In our control stations, just outside the area affected by oil, normal healthy bottom fauna are present. This suggests that oil per se, acting either directly or indirectly, and not the detergents used, is the causative agent. Furthermore, the kill was evident before the dispersants were applied.

(4) In the Wild Harbor area, the presence of oil and benthic mortality was detected at all depths down to the maximum depth of 42 feet.

(5) Mortality was of two sorts. There was first the massive initial mortality which occurred during the first few days. The remains of the soft-bodied organisms rot and disappear within a week and only those animal residues with hard parts remain. The secondary mortality is more gradual and still occurring.

(6) In much of the upper reaches of Wild Harbor River almost no species of animal life have persisted. Among the few surviving forms is the pollution indicator polychaete -- Capitella capitata -- which has increased explosively in numbers and occupies the bottoms in very dense concentrations. As of today, nearly ten months after the oil spill, there is as yet no indication of recolonization of the intertidal habitat by any species other than Capitella.

- 3 -

(7) Subtidally, there are indications that the zone of oil pollution is spreading. Some of the original control stations near the edges of the polluted zone with unaffected faunas now contain oil, and there is mortality among the most sensitive benthic animals. As a result, new control stations farther away from the polluted area were established.

(8) Sediments, both intertidal and subtidal, particularly those with a predominantly sandy component, have become more unstable. Apparently, this is due to the absence of animal secretions and tubes and benthic algae which bind the sediment.

(9) Subtidal sediments with some admixture of sand and mud in this geographic region are dominated by amphipod crustaceans belonging to the Family Ampeliscidae. These animals are a major food source for many bottom-feeding fishes. Our studies have shown that ampeliscids are remarkably sensitive to oil. Whenever even the minutest quantities are present in the sediments, this significant faunal element is invariably missing. Thus, these crustaceans are sensitive indicators of oil pollution. Conceivably, ampeliscid amphipods may already be absent from those areas of the New England and Middle Atlantic coasts that are exposed to chronic, low-level oil pollution.

(10) Marsh grasses that came in contact with the waterborne oil at high tide during the first three weeks after the oil spill were killed. There has been no new growth as yet in the more heavily affected parts of the marsh.

(11) Representatives of the surviving remnants of the invertebrate species that are still present in Wild Harbor River have been collected with the same suite of species from nearby Sippewissett Marsh which serves as a control. Our objective is to learn whether reproduction is affected in the area polluted with oil. In the one species so far examined, the blue mussel, Mytilus edulis, animals from unpolluted Sippewissett Marsh have ripe, well-developed gonads filling the body cavity. The gonads of the representatives from Wild Harbor, on the other hand, are thin, emasculated, hardly more than empty sacs.

RECOMMENDATIONS

1. Concerning the specific case of the Piney Point installation, we lack the necessary background information to determine both whether biological damages have resulted from the numerous oil spills and to evaluate the extent of the damages. A control habitat in the Potomac Estuary with no known history of possible oil pollution should be studied. The site must simulate the Piney Point habitat as closely as possible regarding all environmental conditions such as water currents, depth of water, sediments, temperature, salinity, etc. A detailed biological comparison of the two localities can provide some measure of the impact of possible oil pollution at the Piney Point site.

2. In more general terms, we lack the basic information on marine communities and their distribution in our shallow coastal and estuary zones under normal conditions. Without this frame of reference, any studies of oil pollution or other "sick" environmental situations are difficult or impossible to interpret. Basic investigations of a sufficiently detailed nature of marine communities are a critical prerequisite to these more practical considerations. Unfortunately, the qualified personnel able to obtain the necessary baseline data are in severely limited supply. Every effort should be made to train additional highly competent individuals for this area of research.

3. Considering the magnitude of the problem and the limited and somewhat controversial nature of the information available on the effects of oil on the biota, we cannot afford to wait for oil spills to occur fortuitously near marine laboratories where there might be a group of scientists who have the competence, liberty, and inclination to exploit the opportunity. We probably have reached the point where it has become necessary to create controlled oil spills under highly selected conditions where the biology has been carefully monitored in great detail beforehand. Different kinds and quantities of oil might be introduced into the environment. Their effects on the various components of the biota and the biodegradation of the oils themselves can be measured over time. Laboratory experiments in conjunction with the field experiments would be run as corroborative evidence. Such investigations can provide a sound basis for meaningful oil pollution legislation. However, because of the politically sensitive nature of the studies, support and evaluation of such research should be undertaken by a disinterested yet prestigious body. The National Research Council would be a most appropriate choice.

- 5 -

4. If teams of highly trained personnel were available, who at an instant's notice could be dispatched to the scene of an actual or incipient oil spill such as the recent blow-out off Louisiana, much valuable information could be collected. Our studies of the West Falmouth spill demonstrate the critical importance of documenting the response of the biota during the first few days after the introduction of the pollutant into the environment. However, jurisdictional disputes and overlapping areas of responsibility among various government agencies and the necessity of working through a chain of command within a given agency preclude any possibility of making an immediate and, therefore, meaningful response to the opportunities provided by such catastrophes.

I recommend that teams of scientists and technicians be organized for the expressed purpose of responding to oil spills much in the same manner of the Civilian Aeronautics Commission in regard to a major air accident. The teams would be flown immediately to the site of the oil spill together with the equipment needed for carrying out a successful sampling program. Boats and logistic support can be provided by local government representatives. Again, because of the politically sensitive nature of such studies, the operation of the program might best be placed within the National Research Council for jurisdictional and evaluation reasons.

HOWARD LAWRENCE SANDERS

Biologist

Senior Scientist

Woods Hole Oceanographic Institution

B.A., University of British Columbia, 1949

M.S., University of Rhode Island, 1951

Ph.D., Yale University, 1955

Research Associate, 1955-63; Associate Scientist, 1963-65;
Senior Scientist, 1965 to present, Woods Hole Oceanographic
Institution

Instructor, Marine Biological Laboratory, 1960 to 1968

Editorial Board, Limnology and Oceanography, 1962-64

Consulting Editor, Pacific Naturalist, 1963 to present

Board of Editors, Journal of Marine Research, 1964-66

Member, Committee on Arthropods for the Smithsonian Oceanographic
Sorting Center (SOSC) 1965-1968

Member, Editorial Board, Archivio di Oceanografia e Limnologia
1968-present

Member, Biological Methods Panel of the National Academy of
Sciences Committee on Oceanography. Chairman of the Working
Group on Benthic Productivity.

Member, Corporation of the Marine Biological Laboratory

Member, Bermuda Biological Station for Research

Associate in Invertebrate Zoology, Harvard University

National Science Foundation Environmental Biology Advisory Panel
Member, 1966-68

Member, Review Committee of the Duke University Cooperative
Research and Training Program in Biological Oceanography,
1968-1970, Chairman, 1970

Adjunct Professor of the Biological Sciences, State University
of New York at Stony Brook, 1969

Member, Advisory Panel of the National Academy of Sciences for
the Central American Sealevel Canal, 1969-1970

Research in Ecology: Ecology as applied to marine benthic
communities; Crustacean phylogeny

Author or coauthor of about 35 publications in ecology

R. Moore

These gentlemen, without going into all their findings, state that once an oyster or any type of shellfish has ingested oil to any degree, it cannot ever purge itself of that oil, and they will be forever irreparably hung with a slick intestine. (Laughter.)

And of ocurse, they are not of any value commercially, as you know, for that reason.

The town of Falmouth -- you don't read about this in our local newspapers -- they sued the Northeast Petroleum Company and got \$118,000 for the damage to their scallops. We do see locally the poor oystermen and people over there in Louisiana when they sued the Federal courts after the Chevron blowout. And their suit was dismissed because, you know, "There really wasn't any damage." These people got \$118,000.

Northeast Petroleum settle for \$100,000 out of court. The division of Marine Fisheries of the State of Massachusetts had also sued for \$300,000 and settle for \$200,000 out of court.

Please don't be misguided by the false information that you have been given that even if you do have a major disaster spill out there, it won't really hurt oysters because it's just oil flowing

R. Moore

on the top of the water, and it will just wash away and won't even be around. I have heard that, not from one but from 14 men who were petroleum engineers from these various oil companies who came to my office to talk me into withdrawing my protest. "You don't know what you are talking about, with all due respect, Mr. Moore. It won't hurt any marine life. As a matter of fact, it helps them a little bit. They have a little bit of it in their system because of the natural oil seepages" and that sort of information.

I don't know if that is the last slide or not. Is it?

What I want to say to you, gentlemen, is that Bob Armstrong, the Land Commissioner, was approached by me asking him to effect a moratorium that he has the power within the State to effect immediately -- a moratorium in all of our estuarine areas.

Bob ran on a conservation platform and walked the beaches and had some real nice political television time showing what a great conservationist he was and he said, "Well, Bob, I know, but you see the Texas Parks and Wildlife know more about that than I do, and I just pass it over to the Texas Parks

R. Moore

and Wildlife and let them tell me."

Of course, you gentlemen don't know this, but when he had the problem with the shell dredgers in the bay a few years back, the recommendation of the Texas Parks and Wildlife was that you shouldn't dredge for shell any closer than 1,500 feet from a live oyster reef. And Governor Connally thought so much of our Texas Parks and Wildlife Department that he allowed them to move within 300 feet. So I say to Bob Armstrong, "Bob, you are not doing right. You can't depend on the Texas Parks and Wildlife to get the job done." Not that they don't have good men -- certainly very well, very able, very qualified men. But those men are intimidated in the worst form. And you have probably seen the recent results of that with regard to when they wanted to buy Mustang Island. Two out of three of them did. It doesn't make any difference even if the directors of the Texas Parks and Wildlife want something. If the government of the State and the people that back them don't want it, then the citizens don't get it. So we can't depend on our State agencies.

Mr. Yantis at the Texas Water Quality

R. Moore

Board, I am not sure what standards he uses when these various oil companies file for their applications to drill in the bay. And I understand the Corps of Engineers is merely the last hurdle and for all the ills and wrongs they have perpetuated in the name of safety ecology. Again, I have to give them credit. They have temporarily halted this in West Bay only and caused the companies some concern and caused them to come forward because neither the Texas Water Quality Board, Railroad Commission, Texas Parks and Wildlife, or no one in our State Government would help us in the problem. And you probably heard this morning on the radio -- it is not just my testimony -- our own legislative Environmental Committee came out with a statement to show that the true facts are that there has been a calloused disregard for our Railroad Commission and the Texas Water Quality Board when it comes to the question of environment.

You people, regardless of whether or not you are working for the Federal Government or who you are individually, I wholeheartedly entreat you to answer this 1 citizen's request to direct the Corps

R. Moore

of Engineers not to allow any further drilling applications in these areas unless something has been done to abate the overall problem.

Thank you. (Applause.)

MR. YANTIS: Thank you, Mr. Moore.

Mr. Stein wants to read something into the record.

CHAIRMAN STEIN: I just want to put something into the record. This fits right in with your statement, Mr. Moore.

There was an analysis of Galveston Bay oysters for petroleum hydrocarbons. This is an addendum to Mr. Gallagher's response to questions on oil and hydrocarbon residues and his methodology. This will be put in the record.

[The above-mentioned addendum follows.]

ADDENDUM TO FEDERAL REPORT

FURTHER INVESTIGATIONS
OIL AND HYDROCARBON RESIDUES
IN
GALVESTON BAY, TEXAS

Division of Field Investigations - Denver Center
Denver, Colorado

UNITED STATES GOVERNMENT

Memorandum

1262

TO : Director, DFI-DC

DATE: December 15, 1970

FROM : Chief Chemist

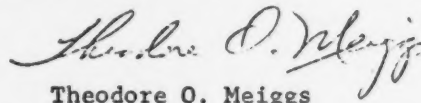
SUBJECT: Oyster Contamination Data Evaluation

I have reviewed the results Mr. Ehrhardt obtained when analyzing four Galveston Bay oysters for hydrocarbon residues, and have come to the following conclusions:

1. Oysters from all four sampling stations contained residues of petroleum hydrocarbons.
2. The hydrocarbon residues were not of natural origin but derived from petroleum wastes.
3. The oyster collected at Station 2 was grossly contaminated as evidenced by the high concentration of hydrocarbons (237 ppm). The oysters at Stations 1 (26 ppm), 3 (30 ppm), and 4 (23 ppm) were probably exposed to smaller quantities of hydrocarbons.
4. The variations observed in hydrocarbon content may indicate either different sources of contamination or if the sources are the same, then the frequency of contamination. In Galveston Bay, the latter is likely the case.

Mr. Ehrhardt had separated the organics extracted from each oyster into several fractions depending upon hydrocarbon polarity. Fraction 1 was comprised of saturated hydrocarbons, fraction 2 was a mixture of saturates and low molecular weight aromatics, fraction 3 was mostly simple aromatics, and fractions 4 and 5 contained any high molecular weight or polyaromatic materials such as naphthalene, etc.

All oyster samples contained aromatics in fraction 3. The relatively large amounts of aromatics found in the oyster from Station 2 (fractions 3, 4, and 5) may indicate frequent recurring contamination since aromatic hydrocarbons have been found to accumulate in shellfish.



Theodore O. Meiggs

TOM:sjm



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WOODS HOLE OCEANOGRAPHIC INSTITUTION

1263

WOODS HOLE, MASS. 02543

December 11, 1974



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Date: 1/5/75

Dr. A. A. Rosen, Chief
Water Sciences Section
Division of Field Investigations
United States Department of the Interior
5555 Ridge Avenue
Cincinnati, Ohio 45213

Dear Dr. Rosen,

We have finished now with the analyses of the four oyster samples from locations in the Gulf of Mexico, identified as samples #1, 2, 3 and 4. Before giving the results I would like to outline briefly the analytical procedure and instrumentation used for the analyses.

The solvents were redistilled analytical grade. The equipment consisted of a Varian 1200 gas chromatograph with FID, 7½ feet stainless steel column (1/16" i.d.) packed with 3% Apiezon on siliconized acid washed chromosorb W. Furthermore a Cahn Model G2 micro electrobalance, and a Cary Model 14 recording spectrophotometer.

The analytical procedure was essentially the following: The oyster meat was extracted in purified soxhlet thimbles with methanol for 24 hours and with methanol + 25% benzene for an additional 12 hours. The extracts were shaken four or five times with a total amount of 200 ml n-pentane. The combined n-pentane layers were once washed with water, dried with anhydrous sodium sulfate and evaporated below room temperature in a rotary evaporator. The residue was dissolved in n-pentane and transferred to a column filled with 32 g of silicagel + 5% H₂O and 16 g of Al₂O₃ + 6% H₂O as separate layers. The column was eluted with pentane + benzene 1:1 (appr. 150 ml). The eluate was evaporated below room temperature dissolved in n-pentane, and transferred to activated (220°C) silicagel TLC plates. The TLC plates were developed with iso-octane. After visualization under UV light 3 or 5 fractions were cut from the sheet. The first fraction contained the aliphatic, saturated cyclic and part of the monoaromatic hydrocarbons, the second fraction mono- and diaromatic hydrocarbons, the third fraction di- and presumably triaromatic hydrocarbons (strong absorption near 255 nm, weak absorption above 320 nm, suggesting phenanthrenes). The solid support was scraped off the aluminum sheet, extracted with benzene, and the benzene evaporated below room temperature. The fractions were dissolved in CS₂. An aliquot containing approximately 50 µg was injected into the gas chromatograph. Another aliquot containing one tenth of the total fraction was evaporated on an aluminum dish and weighed on the Cahn electrobalance. For the measurement of UV absorbance approximately 50 µg of each fraction was dissolved in 2 ml of n-pentane.

Results: From the gas chromatograms it is evident that the oysters are contaminated by mineral oil. In the saturated fractions a broad unresolved hump originating from cyclic saturated hydrocarbons and branched chain alkanes underlies the prominent peaks of some naturally occurring hydrocarbons and the series of n-alkanes from a mineral oil starting as low as C_{12} in sample #2. The intermediate fractions are poorly resolved but later fractions show distinct peaks, fraction 2₅ for instance suggesting the presence of a homologous series of alkylated naphthalenes and phenanthrenes.

The UV spectra reveal the presence of mono-, di- and very likely triaromatic hydrocarbons. This conclusively proves the contamination by mineral oil, because aromatic hydrocarbons are absent from any uncontaminated organism. The possibility that the UV spectra are due to aromatic chromophores in biogenic compounds e.g. aromatic amino acids, is ruled out by the chromatographic qualities of the fractions in question.

Quantitative Results: Hydrocarbon content as calculated on 100 g of wet weight:

#1 ₁ : 1.87 mg* (70.80%)	#2 ₁ : 0.33 mg (1.39%)
#1 ₂ : 0.58 mg* (22.00%)	#2 ₂ : 9.91 mg (41.80%)
#1 ₃ : 0.19 mg* (7.20%)	#2 ₃ : 0.98 mg (4.13%)
Sample #1 Total: 2.64 mg*	#2 ₄ : 9.16 mg (38.63%)
	#2 ₅ : 3.33 mg (14.04%)
	Sample #2 Total: 23.71 mg
#3 ₁ : 1.65 mg (55.74%)	#4 ₁ : 0.68 mg (30.09%)
#3 ₂ : 0.89 mg (30.07%)	#4 ₂ : 1.27 mg (56.19%)
#3 ₄ : 0.42 mg (14.19%)	#4 ₃ : 0.31 mg (13.71%)
Total: 2.96 mg	Sample #3 Total: 2.26 mg

* These figures might be too low due to a temporary failure in the cooling water supply during the soxhlet extraction.

The different percentages are due to different sources of pollution and/or different time of exposure to pollution. Aromatic hydrocarbons are the most persistent components of mineral oils in the environment and tend to be enriched in the shellfish.

Yours very sincerely,

Manfred Ehrhardt
Manfred Ehrhardt

AE/akt

P.S. Enclosed are Xerox copies of the gas chromatograms and UV spectra.

UNITED STATES GOVERNMENT ENVIRONMENTAL PROTECTION AGENCY - WATER QUALITY OFF.
Memorandum Division of Field Investigations - Denver Center
Room 410, Building 22, Denver Federal Center
Denver, Colorado 80225

TO : Director, DFI-DC

DATE: February 11, 1971

FROM : Chief, Chemistry Section

SUBJECT: Petroleum Contamination of Galveston Bay Oysters

On January 14 and 15, 1971, oysters were collected at 10 stations in Galveston Bay (Figure 1). The oysters were transported on ice to Cincinnati, Ohio, and then frozen to await analysis. Mr. John Connor and I traveled to Cincinnati on January 25 in order to analyze these oysters for petroleum contamination.

With the cooperation of Dr. A. A. Rosen, Chief, Water Sciences Branch, DFI - Cincinnati, we were allowed to use equipment and facilities at both the Ridge and Columbia Parkway laboratories. Using methods developed at the Woods Hole Institute and described in detail in the attached write-up, we obtained the following results:

1. Measurable concentrations of hydrocarbons were separated from oysters taken at all stations in Galveston Bay. These concentrations are summarized in Table 1. The highest concentrations were found in oysters collected in the vicinity of the Houston Ship Channel, particularly at Station 2, where the Channel enters the Bay. Hydrocarbon concentrations were lowest at Stations removed from (Station 7) or protected from (Station 3) the Ship Channel.
2. The presence of normal alkyl hydrocarbons was confirmed by gas chromatography.
3. Ultraviolet absorption spectra of the oyster extracts demonstrate that a portion of the hydrocarbons are aromatic and, therefore, are not of natural origin.
4. The results obtained in January are comparable to those obtained by Woods Hole personnel in November, suggesting long-term contamination.

As we indicated in the Galveston Bay Report, these concentrations of petroleum products are higher than those obtained from oysters exposed to the

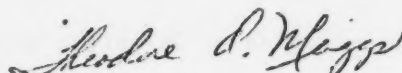


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Petroleum Contamination of
Galveston Bay Oysters

2

West Falmouth Oil Spill of 650,000 to 700,000 l. of #2 fuel oil and definitely support our contention that Galveston Bay is severely degraded by petroleum materials.



Theodore O. Meiggs, Ph.D.

3 Attachments

1. Figure 1
2. Table 1
3. Analytical Scheme

cc: Dr. Rosen, DFI-Cincinnati
Mr. Hirth, DFI-Cincinnati
Mr. Blackman, DFI-DC
Mr. Schneider, DFI-DC
Mr. Connor, DFI-DC
Mr. Warner, DFI-DC

TABLE 1 Concentrations of Hydrocarbons Separated from Galveston Bay
Oysters, November 1970 and January 1971

<u>Station Number</u>	<u>Hydrocarbon Concentrations (ppm)</u>	
	<u>November 1970</u>	<u>January 1971</u>
1	26	-
2	237	159
3	30	24
4	23	33
4A	-	28
5	-	40
7	-	11
8	-	54*
9	-	45
10	-	61
11	-	25

* Result questionable (probably high).

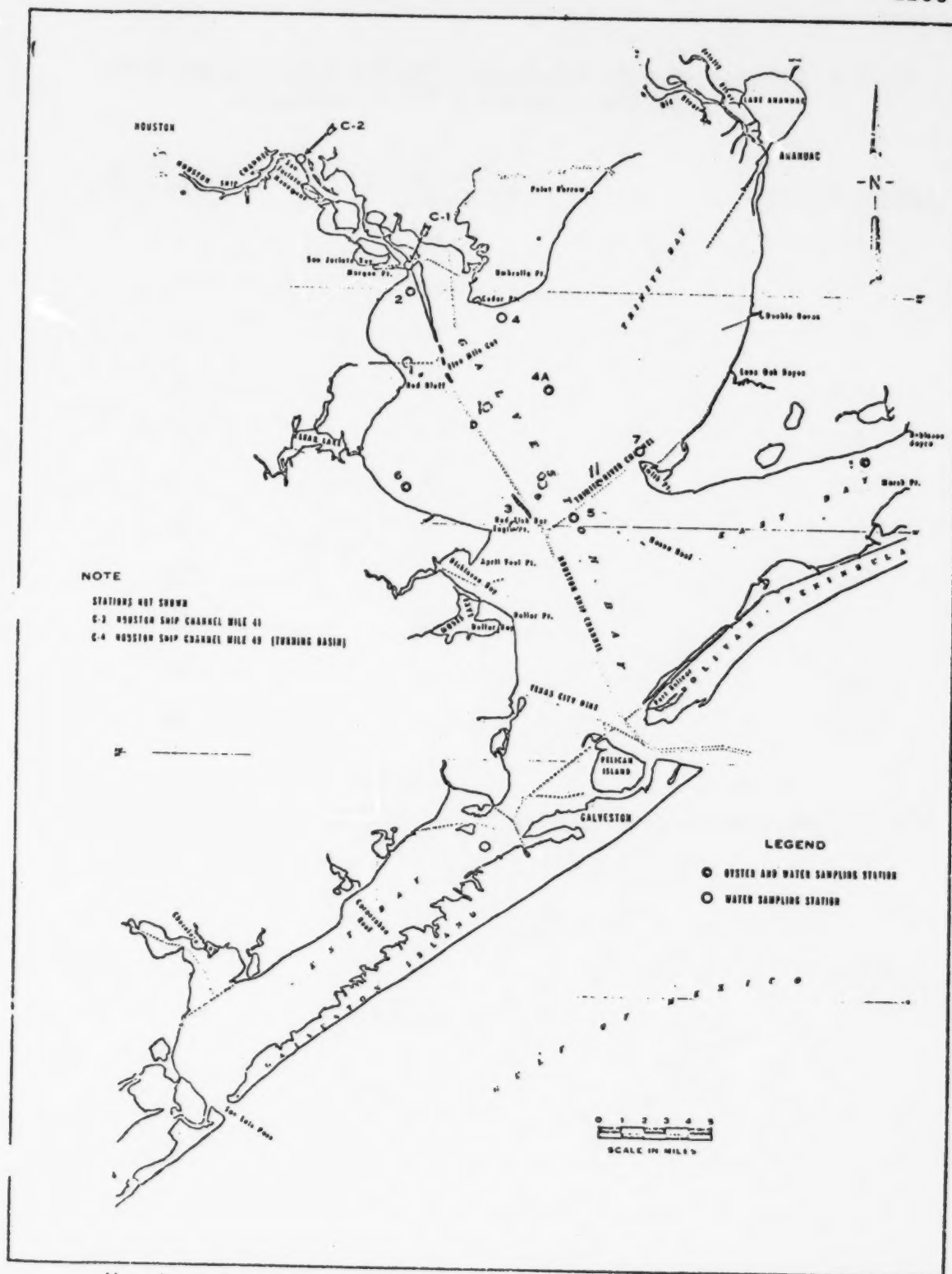


Figure A - II Water and Oyster Sampling Locations - FWQA Reconnaissance Survey, November 1970

ANALYSIS OF GALVESTON BAY OYSTERS
FOR PETROLEUM HYDROCARBONS

I. Collection and Transportation of Oysters

On January 14 and 15, 1971, oysters were collected at 10 stations in Galveston Bay, by Messrs. Connor, Warner, and Metzler. The oysters were put on ice and transported by air to Cincinnati, Ohio. At Cincinnati the oysters were frozen until analyzed.

II. Extraction of Oyster Tissue

Petroleum hydrocarbons were separated from the oyster tissue by soxhlet extraction. First, the oysters were removed from the shell. Then ca. 100 g of tissue (4 to 7 whole oysters) was carefully weighed and placed in pre-extracted soxhlet thimbles. The tissue was extracted for 24 hours with ca. 300 ml methanol.* Then ca. 100 ml benzene was added and the extraction continued for 12-18 hours. Occasionally severe bumping and foaming occurred during the methanol extraction, and fresh solvent was required.

Upon cooling, the 25 percent benzene extracts were added to liter separatory funnels and shaken with 3 x 100 ml portions of n-pentane. The hydrocarbons were taken into the pentane and the methanol layer was discarded. The pentane was then rinsed with 100 ml distilled water to remove any traces of methanol and passed through phase separation paper to remove the last traces of water. The dark green pentane extracts were then concentrated at room temperature on a rotary evaporator.

III. Column Chromatography

The pentane soluble materials were subjected to column chromatography to separate most of the naturally occurring lipids. A column was prepared

* All solvents were Burdick and Jackson (distilled in glass grade).

Analysis of Galveston Bay Oysters (Contd)-

of 40 g silica gel deactivated with 5 percent water topped with 20 g aluminum oxide deactivated with 6 percent water. The adsorbants were added as separate layers under pentane. Following pentane evaporation, the extracts were added to the top of the column and eluted with 200 ml 1 + 1 benzene and pentane. A band of yellow material was observed to pass through the column. A green band stayed at the top of the Al_2O_3 layer and a yellow band on the silica gel. The eluent was concentrated at room temperature on a rotary evaporator.

IV. Thin Layer Chromatography

The hydrocarbon mixture was further purified by thin layer chromatography to remove the remaining natural substances. Plates of Silica Gel-G, 0.25 mm thick, were obtained from Custom Chemical Services, Inc. The plates were activated at 220° for over 2 hours. The samples, dissolved in ca. 0.5 ml pentane, were spread on the plates as a narrow line. The plates were eluted with iso-octane for a distance of 10 cm. Upon drying, the plates were exposed to ultraviolet light.

Most evident was a pronounced yellow band extending across the plate ca. 3 cm above the spotting line. Under UV light, a very light band was observed ca. 7 cm above the spotting line. The region containing this upper band was designated Fraction 1 and the region between this and the yellow band was designated Fraction 2. An example of a typical separation with the designated fractions is shown in Figure 2. The two fractions were scraped from the plate and eluted with ca. 5 ml benzene. The benzene was removed by evaporation and the residue taken up in 1.0 ml CS_2 . Portions of each fraction were then weighed on a Cahn Model G electro balance after

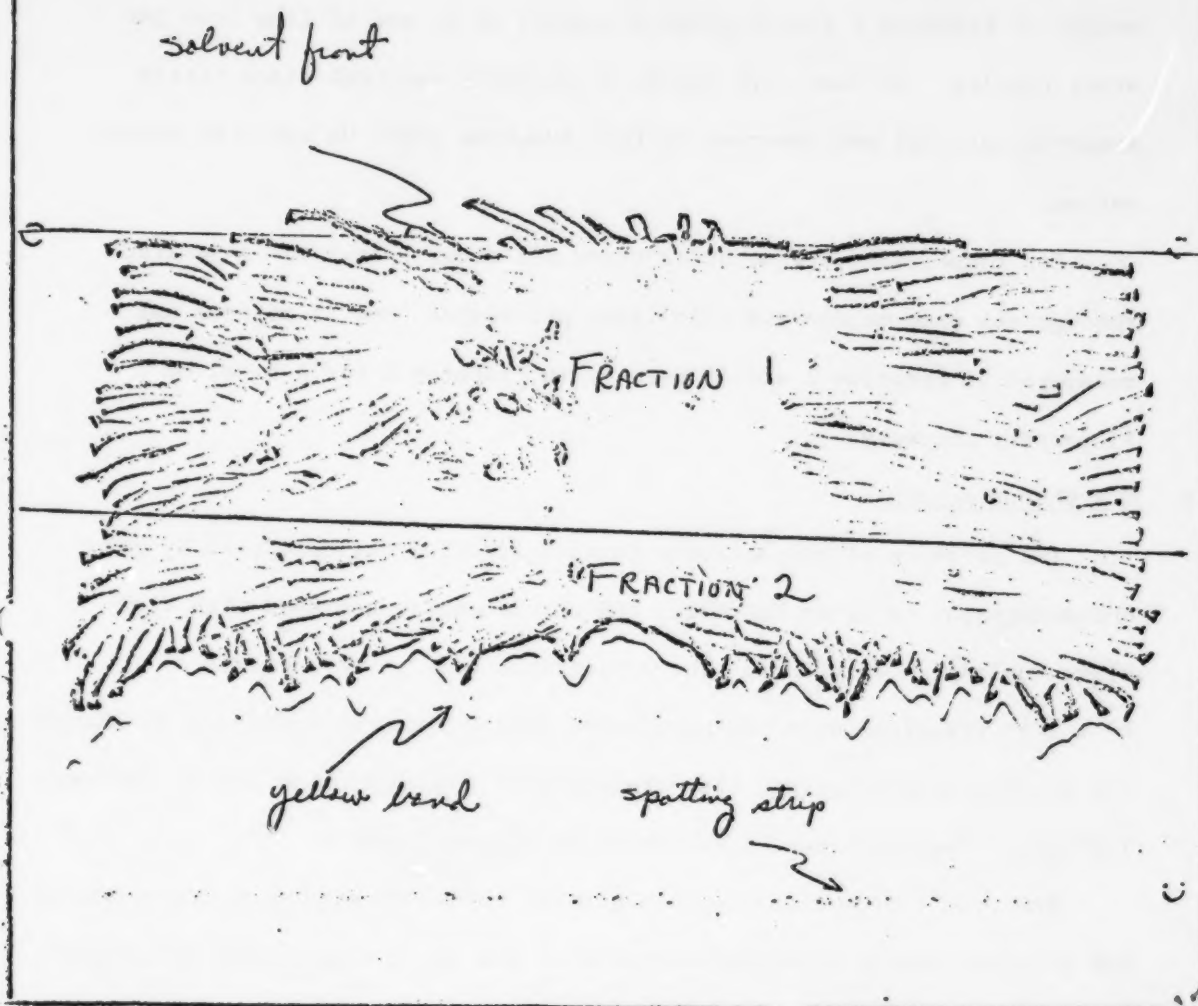


fig. 2. Example of a thin layer separation, showing Fraction 1 and Fraction 2 scraped off.

evaporating the solvent. The results are summarized in Table 2. The weight of Fraction 2 from Station 8 appears to be out of line from the other results. We feel this result is probably too high since little aromatic material was observed in this fraction under UV spectral examination.

For comparison, a Venezuelan crude oil (Logunillas) was separated through the same column and thin layer procedures, and 53 percent was recovered in Fraction 1 and 18 percent in Fraction 2 for a total of 71 percent recovery.

V. Gas Chromatography

The presence of hydrocarbons in each fraction was confirmed by gas chromatography using an F&M Model 700 chromatograph equipped with dual flame ionization detectors. The separations were performed with a 6' x 1/8" stainless steel column packed with 20 percent Apiezon L on Seasorb. The samples were injected, then temperature programmed from 100 to 300° at 7.5°/min. Typical examples are shown in Figures 3 and 4.

Fraction 1 from each sample contained primarily aliphatic hydrocarbons and produced easily identifiable peaks on the gas chromatograph corresponding to a homologous series of normal hydrocarbons. Underlying these distinct peaks was a broad hump characteristic of cyclic and branched isomers. Fraction 2 was not as well defined, but still contained some peaks identifiable as normal hydrocarbons. Apparently, this fraction contained aromatic and higher molecular weight hydrocarbons.

VI. Ultraviolet Identification

The fractions separated by thin layer chromatography were taken to dryness then dissolved in ca. 4 ml n-pentane. The UV absorption spectrum

TABLE 2. Concentrations of Hydrocarbons Separated in Thin Layer Fractions from Galveston Bay Oysters

<u>Station</u>	<u>Concentration (ppm)</u>		<u>Total</u>
	<u>Fraction 1</u>	<u>Fraction 2</u>	
2	105	54	159
3	11	13	24
4	20	13	33
4A	16	12	28
5	23	17	40
7	8	3	11
8	10	44	54
9	27	18	45
10	44	17	61
11	13	12	25

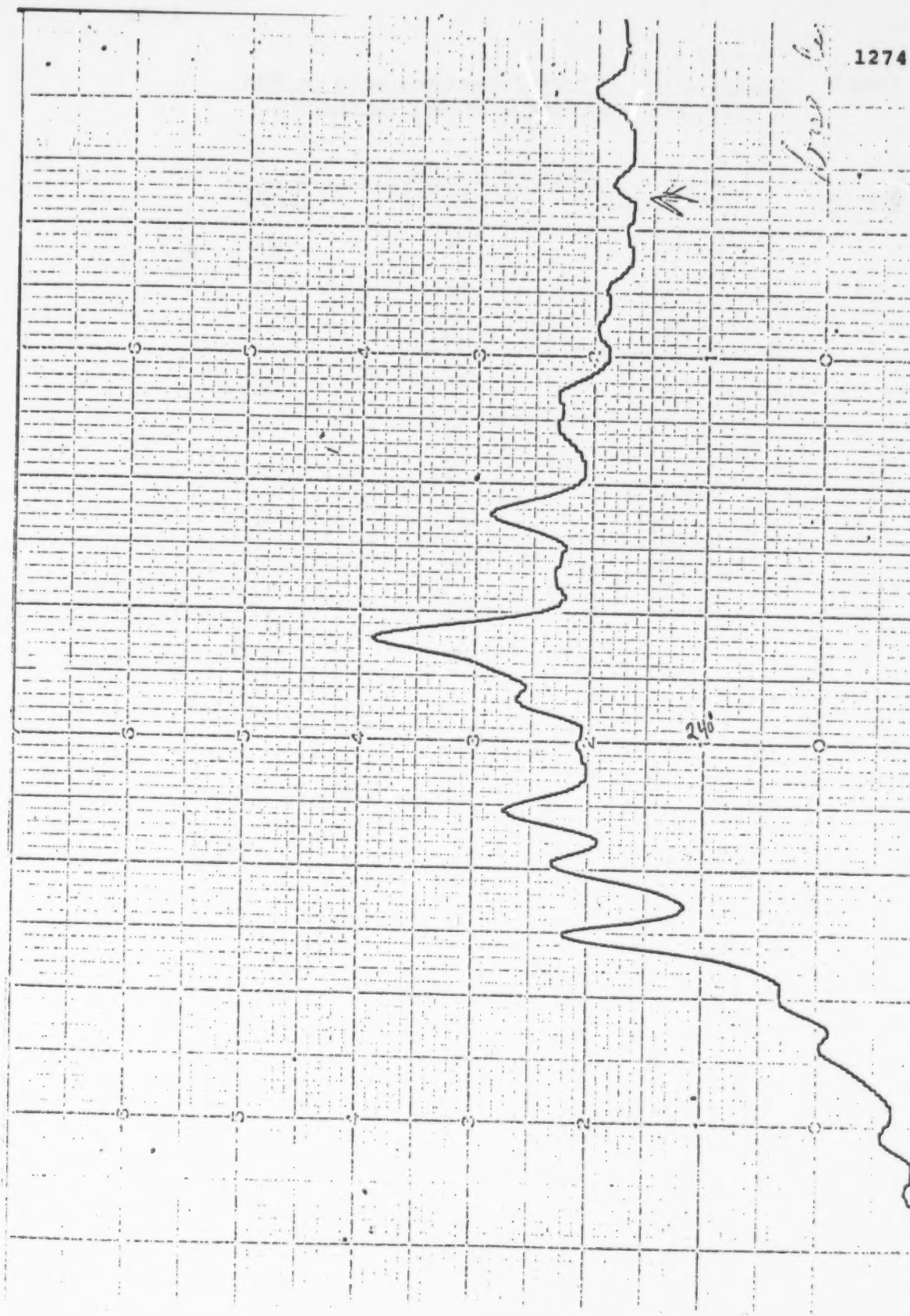
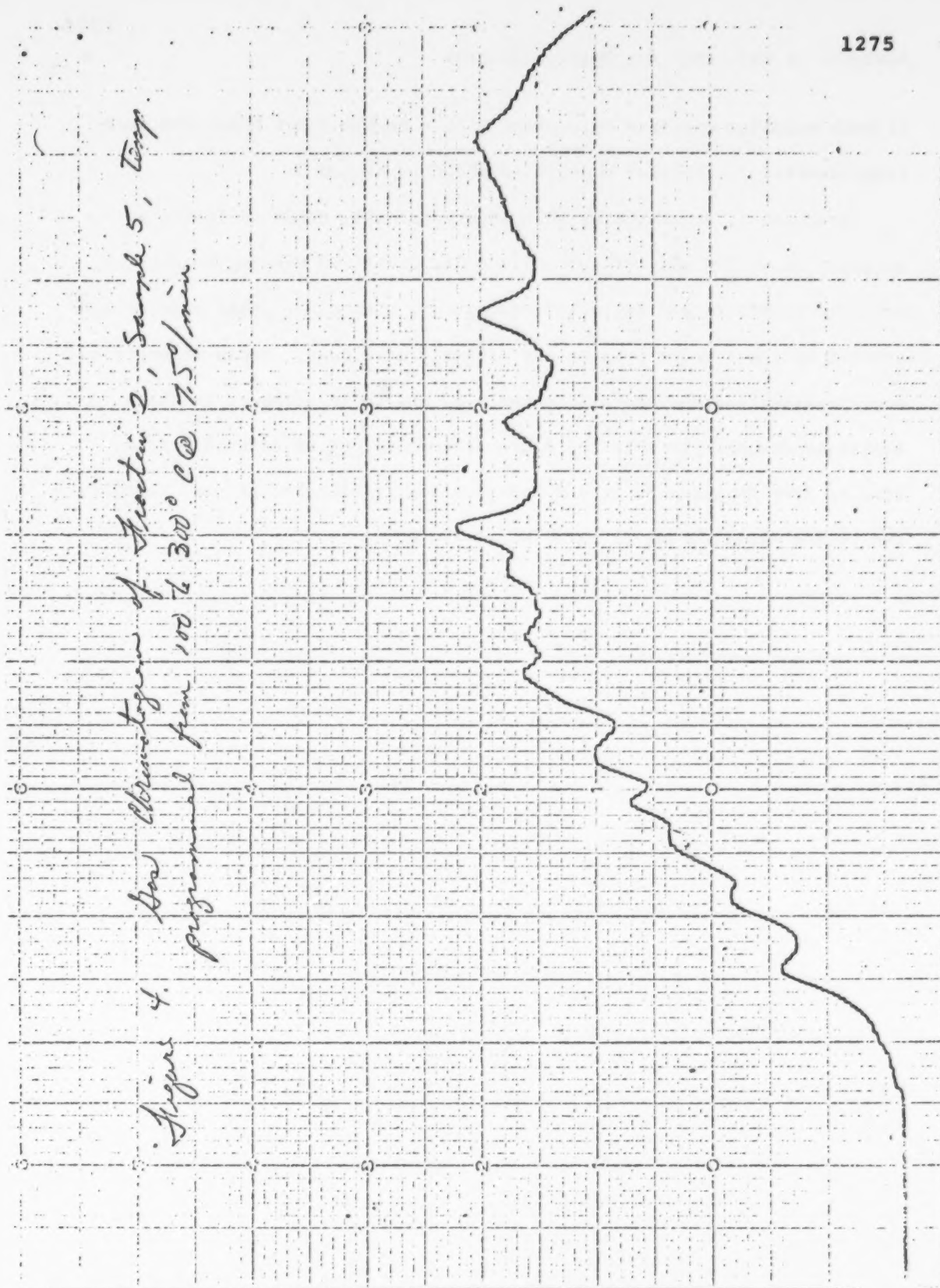


Figure 3.

Gas Chromatogram of Acetic Acid, Sample 5, Temp. programmed 100 to 300 °C @ 7.5 °/min.

Figure 4. Gas chromatogram of fraction 2, Sample 5, Temp.
programmed from 100 to 300°C @ 7.5°C/min.



of each solution was then determined with a Perkin Elmer Model 350 spectrophotometer. A typical example is shown in Figure 5.

Fraction 1, separated by thin layer, normally produced little absorption above 200 m μ . Fraction 2 usually contained varying amounts of aromatic materials and exhibited absorptions with minor peaks between 250 and 280 m μ and a major peak in the vicinity of 230 m μ . These absorptions are characteristic of aromatic materials, and their presence in these abstracts demonstrate that the hydrocarbons are not of natural origin. Samples from Stations 3, 7, and 8 showed negligible absorptions, possibly due to the small amount of material separated.

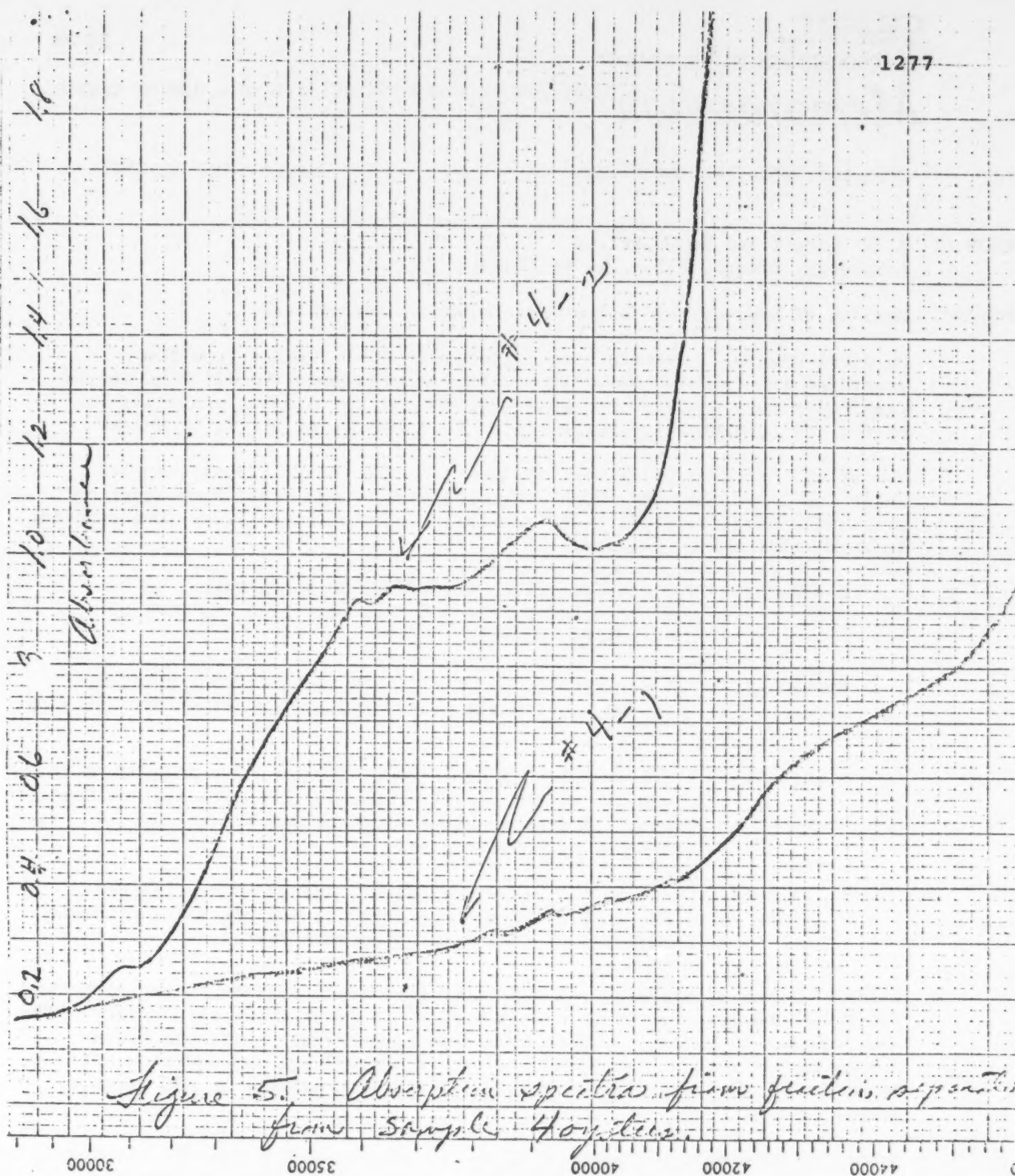


Figure 5. Absorption spectra from fractions separated from Sample 40912.

DATE _____
 PEN RESPONSE _____
 ORD. EXP. _____
 CURVE NO. _____

SCAN SPEED _____
 RESOLUTION _____
 SCAN WIDTH _____

UNITED STATES GOVERNMENT

1278

Memorandum DIVISION OF FIELD INVESTIGATIONS - DENVER CENTER

TO : Director, DFI - Denver Center

DATE: June 2, 1971

FROM : R. W. Warner and T. O. Meiggs
Laboratory Branch, DFI - Denver Center

SUBJECT: Results of hydrocarbon analyses of Galveston Bay oysters

On April 26, 1971, oysters were collected by R. W. Warner from four locations in Galveston Bay. The oysters were transported alive on ice to Cincinnati, Ohio, where they were analyzed for hydrocarbon contamination by the AQC Laboratory personnel under the guidance of Dr. T. O. Meiggs.

Two of the oyster samples were collected from areas previously sampled (Stations 1 and 10), and two of the samples were collected from areas not previously sampled (Stations 12 and 13). Descriptions of locations sampled in April 1971 are as follows:

- Station 1: 9.3 nautical miles (mi_N) east of Smith Point, in north-central portion of East Bay (13.5 mi_N east of Houston Ship Channel).
- Station 12: 1.6 mi_N south of Station 1; in south-central portion of East Bay at Frenchie's Reef (13.5 mi_N east of Houston Ship Channel).
- Station 13: Red Fish Bar; 0.8 mi_N east of Houston Ship Channel; 0.1 mi_N north of Trinity River Channel; 2.8 mi_N east of Eagle Point; 4.1 mi_N southwest of Smith Point (12.1 mi_N southeast of Morgan Point).
- Station 10: Marker "67", at western edge of Houston Ship Channel; 5 mi_N east of Clear Lake Channel; 4.4 mi_N north of Eagle Point (7.2 mi_N southeast of Morgan Point).

Concentrations of hydrocarbons separated from these oysters, along with the results of analyses of oysters collected in November 1969, and January 1971, are reported in Table 1. These data demonstrate that comparable hydrocarbon concentrations were found during each sampling. In addition, it is evident that hydrocarbons can be isolated from oysters in all parts of Galveston Bay.

Questions have been raised whether the hydrocarbons isolated are the result of oil pollution or of natural origin. Hydrocarbons isolated from the oysters collected in November and January produced ultraviolet absorptions characteristic of aromatic compounds. Since oysters do not naturally contain any aromatic compounds, oil contamination was clearly indicated. Recently, Dr. M. Ehrhardt of the Woods Hole Oceanographic Institute has



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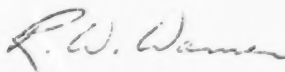
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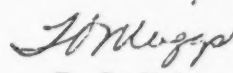
Memo to Director, DFI - Denver Center ,
Subject: Results of hydrocarbon analyses of Galveston Bay oysters
June 2, 1971

separated and identified several aromatic compounds from Station 2 oysters. Using a GC-MS system, Dr. Ehrhardt has identified di-, tri-, tetramethyl biphenyl, and methyl- and dimethyl fluorene in the oyster extracts. This work is continuing and more compounds should be identified in the near future. These compounds are common components of crude oils and many refinery products and their presence in the oyster extracts clearly demonstrates contamination from petroleum.

Unacceptable odors were produced by petroleum hydrocarbon in some Galveston Bay oysters (see November 20, 1970 memorandum from N. A. Thomas to T. P. Gallagher). The degree of off-odor and concentrations of hydrocarbons were highest in the vicinity of Morgan Point and decreased with distance south from Morgan Point (see Figure 1). Concentrations of hydrocarbons and degrees of off-odor were unacceptably high along the Houston Ship Channel as far south as Red Fish Reef and decreased with distance to the east from the Channel. Our data indicate that objectionable petroleum odors will result in Galveston Bay oysters when more than 30 ppm hydrocarbons can be isolated from the organisms.

On April 27, 1971, oysters were collected by R. W. Warner from two locations in Aransas Bay, Texas, for the purpose of identifying "background levels" of hydrocarbon contamination along the Gulf Coast. These analyses were also made at the AQC Laboratory. The oysters from Aransas Bay, Station 3, located on Long Reef approximately 6 nautical miles northeast of Rockport, Texas, yielded 16 ppm hydrocarbons. The oysters from Aransas Bay, Station 4, located approximately 12 nautical miles northeast of Rockport, Texas, off Cedar Point (Mesquite Bay), yielded 13 ppm hydrocarbons. These levels represent petroleum contamination since gas chromatography of the oyster extracts produced peaks very similar to those obtained from the Galveston Bay oysters. It is important to note that the oysters collected in Aransas Bay exhibited no offensive odors.


R. W. Warner


T. O. Meiggs

2 Attachments
#1 - Table 1
#2 - Figure 1

RWW:TOM:mrs/ngl

TABLE 1. -- Concentrations of Hydrocarbons Separated
from Galveston Bay Oysters, November 1970,
January 1971, and April 1971

Station No.	Hydrocarbon Concentrations (ppm)		
	November 1970	January 1971	April 1971
1	26	--	16
2	237	159	--
3	30	24	--
4	--	33	--
4A	23	28	--
5	--	40	--
7	--	11	--
8	--	54*	--
9	--	45	--
10	--	61	50
11	--	25	--
12	--	--	26
13	--	--	19

* - Result questionable.

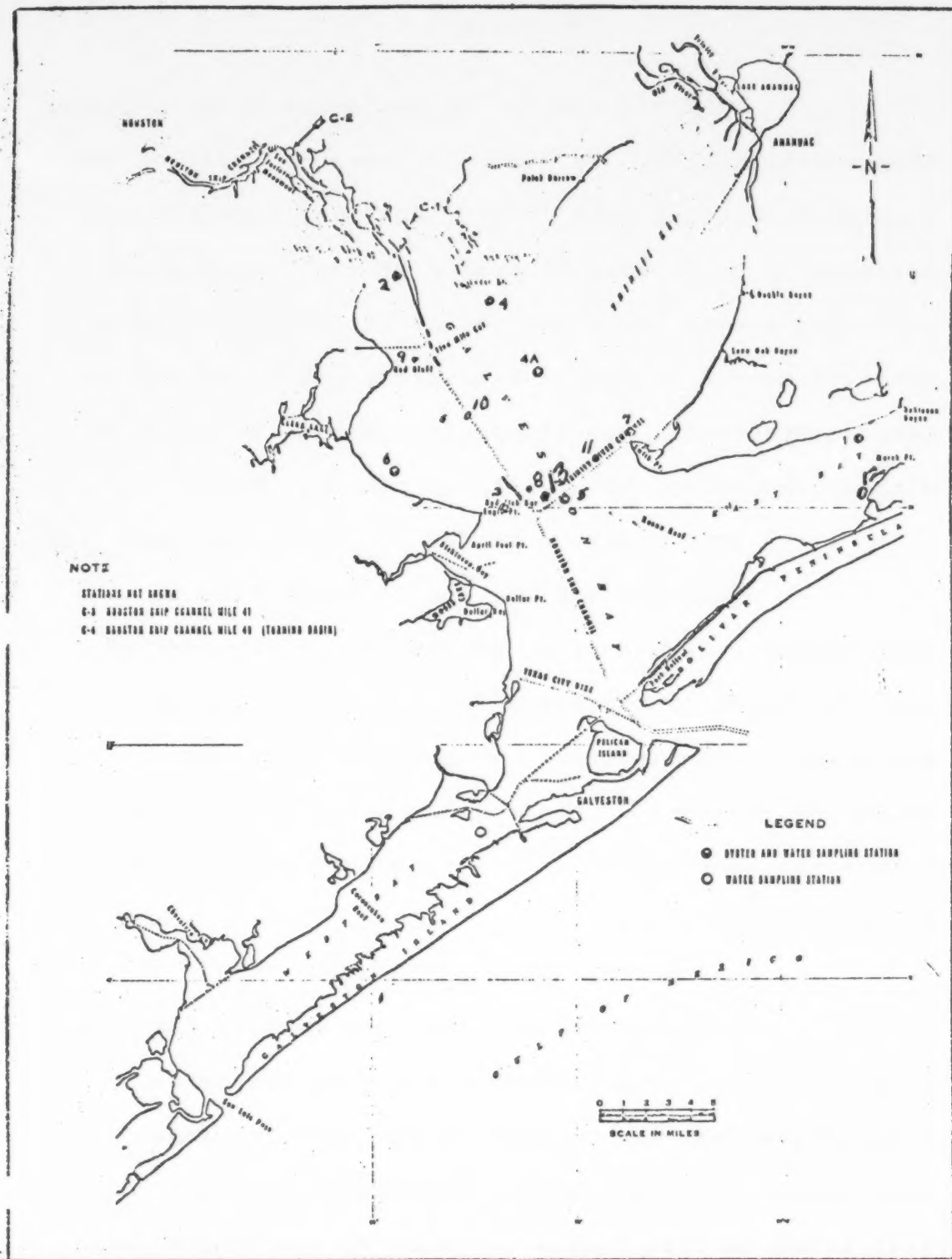


Figure 1 Water and Oyster Sampling Locations - FWQA Reconnaissance Surveys, November 1970 - Jan. 1971

R. Moore

CHAIRMAN STEIN: He was asked about a letter from Massachusetts. We have a telegraphed copy of the text of the letter from John C. Collins, Director, Division of Environmental Health of the Commonwealth of Massachusetts Department of Public Health, to Frank Grice, Director of Marine Fisheries, Department of Natural Resources, Massachusetts, dated June 16, 1971. Without objection, this will go into the record.

[For above-mentioned document, see page 438.]

CHAIRMAN STEIN: Now, I would like to just answer your question, Mr. Moore. I have worked with the Corps of Engineers for a lifetime and we are really close together because of the way we relate to Congress. Both the Corps and I testified before the same committees in the House and the Senate. So we are very close.

MR. MOORE: Very good, sir.

CHAIRMAN STEIN: But, let me tell you, from my experience with the Corps, I can give the Corps a directive, but if you want to get anything done, I will suggest you take a more diplomatic approach. The last thing General Clarke is going to appreciate is a

R. Moore

directive from me, or probably anyone else except his superior, the President.

We do have a very close relationship with the Corps of Engineers, and we do have a function in working out these permits with them. You can be assured we will be in touch with them on this matter.

MR. MOORE: Thank you very much, sir.

CHAIRMAN STEIN: Right.

MR. MOORE: Here also are the maps and charts, if you think they would be necessary.

CHAIRMAN STEIN: Oh, yes. Can you put them in? And you have those slides. Can you give us copies?

MR. MOORE: Dr. Quebedeaux said he will help me get copies of all the slides.

CHAIRMAN STEIN: If you will give us copies of the maps and slides, we will make them a part of the record.

MR. MOORE: Who keeps the exhibits, sir?

MR. YANTIS: Mr. Stein.

CHAIRMAN STEIN: Thank you.

MR. YANTIS: Any philosophical comments

R. Moore

I might wish to make, I will make later so we can
break for coffee or rest or whatever.

[The above-mentioned maps and slides
follow.]

(Whereupon, the conference recessed.)

R. Moore

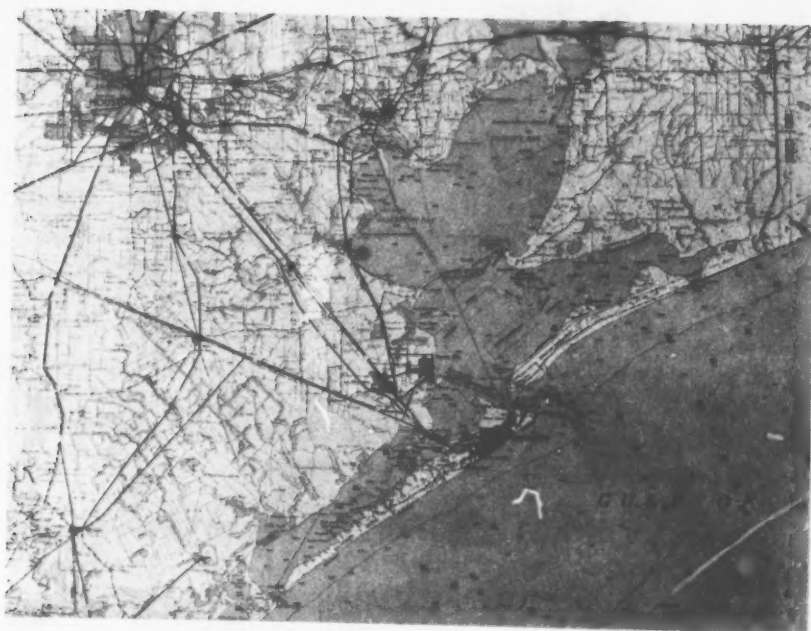
The following is a general synopsis of what the photographs contain:

- #0 Map of Gulf of Mexico, Galveston Island, West Galveston Bay, Trinity and Galveston Bays, East Bay;
- #1 Map of Galveston Island and West Galveston Bay;
- #2 Picture of the Texas City Dike extending from the Mainland showing West Galveston Bay on the right and Galveston Bay on the left;
- #3 Map showing the Western portion of West Galveston Bay, San Luis Pass area, Bastrop Bay area, and the approximate location of the well drilled by Texaco in 1970;
- #4 Same as above, only close-up view;
- #5 Photograph of Map of Galveston Island and portions of West Bay showing depths of water, location of Mobil and Cabot Corporation's applications near the back shoreline of Stewart Park;
- #'s 6-12b Photographs looking from the Mainland South and Southeast across West Galveston Bay, Galveston Island, and the Gulf of Mexico; shows the relative narrowness of West Galveston Bay and the natural marsh and estuarine areas on the Mainland adjacent to West Galveston Bay;
- #13 Northeastern portion of North Deer Island Audubon Sanctuary;
- #'s 14-15 Center portion of North Deer Island Audubon Sanctuary;

- #16 Southwestern tip of North Deer Island Audubon Sanctuary through which one of the State tracts runs in which Clinton Oil wants to drill;
- #'s 17-18 Bird Island Audubon Sanctuary, San Luis Pass area, the location of the three State tracts in which Texaco wants to drill and which are within one mile of the well drilled by Texaco as depicted in photographs 19 through 31;
- #'s 19-31 Aerial photographs as well as photographs on the ground showing the Texaco location drilled on their land which separates Bastrop Bay and West Galveston Bay showing the actual well location, flow pits, and spoil area where dredge material was placed, and also showing slush pits where hydrocarbon materials were left and pipes allowing runoffs;
- #32 Rough map showing the eight State tracts in which Mobil Oil, Clinton Oil and the Cabot Corporation are attempting to obtain permits from the Corps of Engineers to drill wells. The Mobil application also includes the dredging out of portions of Green's Lake and Karankawa Lake in order to drill wells, all nursery breeding areas for shrimp and other forms of marine life.
- #33 Part of the actual application of Mobil Oil showing the depths, widths and placement of dredge material in order to float in drilling rigs; this is standard procedure for the drilling of any wells in this shallow bay;
- #34 Application of Mobil Oil showing their proposed completion of a well by the laying of pipelines from storage platforms in the middle of the bay to the Mainland or to Galveston Island;
- #35 Part of actual application by Mobil Oil showing Karankawa Lake and Green's Lake area and the State tracts in which that company has proposed to drill;

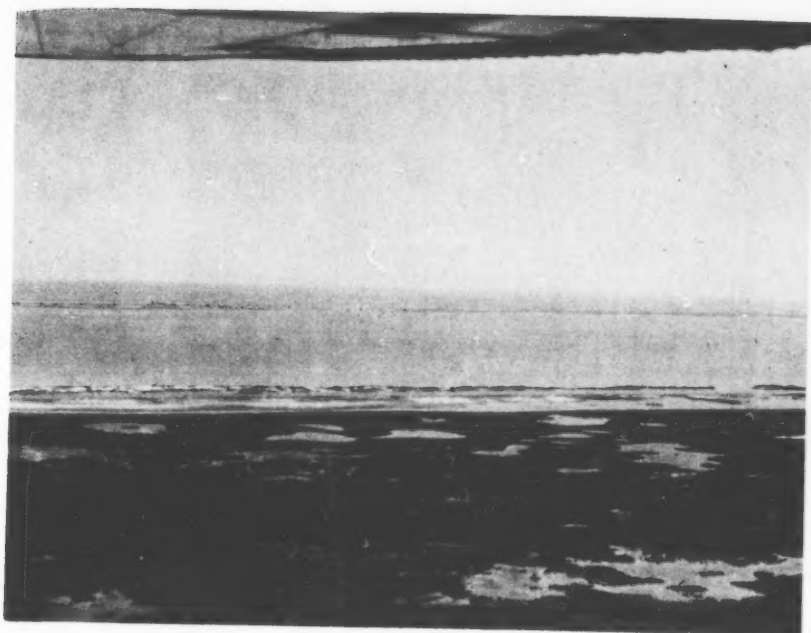
R. Moore

- #'s 36-37 Aerial shots showing the operations of McGinnis Company, just off the Intracoastal Canal and due north of Karankawa Reef which is in about the middle of Galveston Bay; these holding reservoirs contain the "black liquor" waste from Champion Paper Company; similar activities are being contemplated by the Plass Company in this general area;
- #38 Map showing some of the oil and gas fields in Galveston and Trinity Bays;
- #'s 39-43 Photo of a drilling rig in operation in Galveston Bay in April 1971;
- #'s 44-45 Oil slick from solvent and other petroleum products from the floor of the drilling rig, which is not unusual in these operations;
- #'s 46-47 Close-up views of two of the 32 wells in one oil field in the northern portion of Galveston Bay which shows average conditions;
- #48 Platform showing all of the flowlines coming into a separating battery in Galveston Bay, showing that all of the two hundred plus wells in Galveston Bay must have flowlines similar to these; these flowlines have not been charted, many have been there for several years, and through the years there have been numerous pipeline leaks and breaks which dissipate oil into Galveston Bay;
- #'s 49-54 Aerial photos showing some of the 200-plus wells scattered throughout Galveston Bay;
- #'s 55-57 Photos of the Chevron Blowout showing the oil flowing uncontrolled into the air and the water and the process of combating the oil in the water by the spraying of detergents on the oil to make it sink to the bottom.

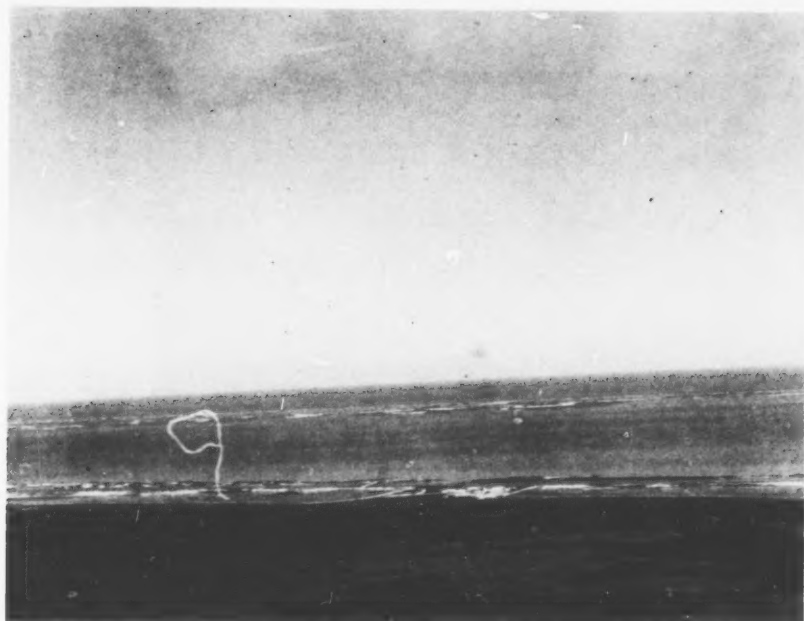




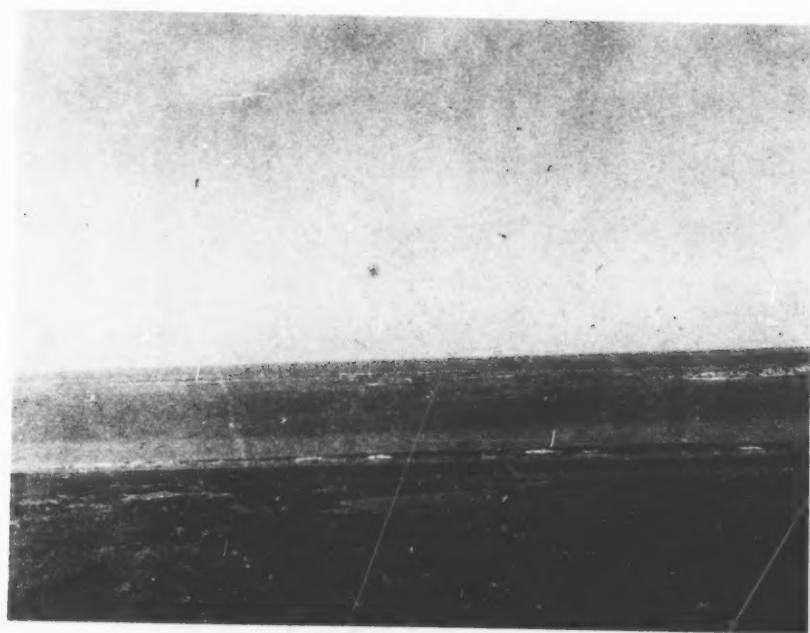
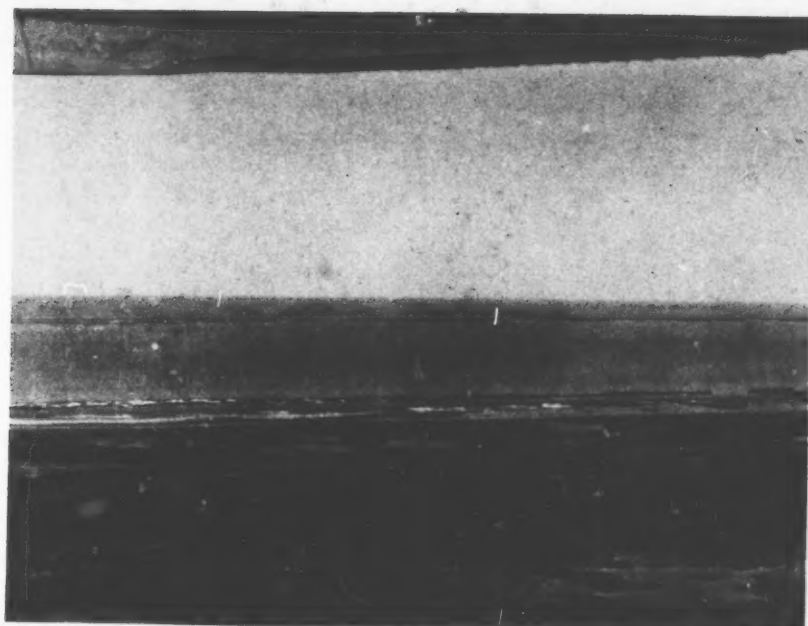


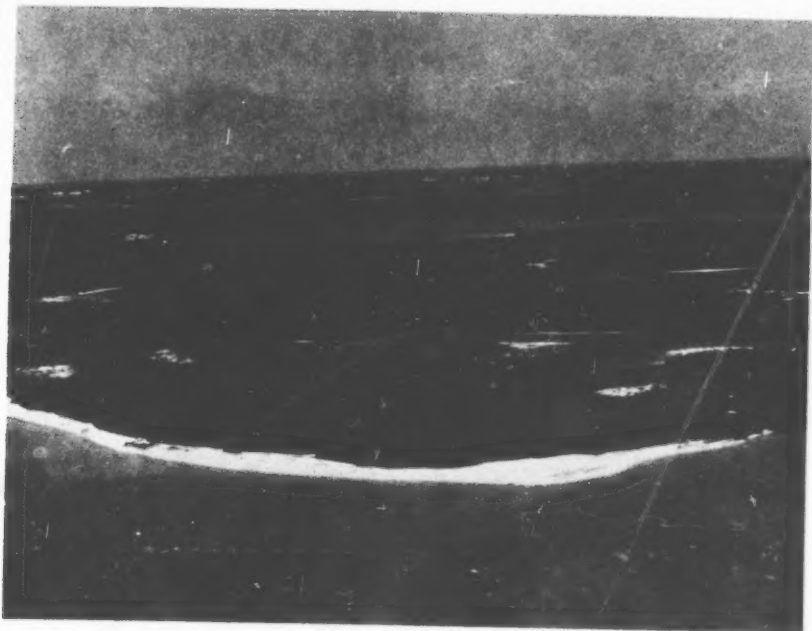


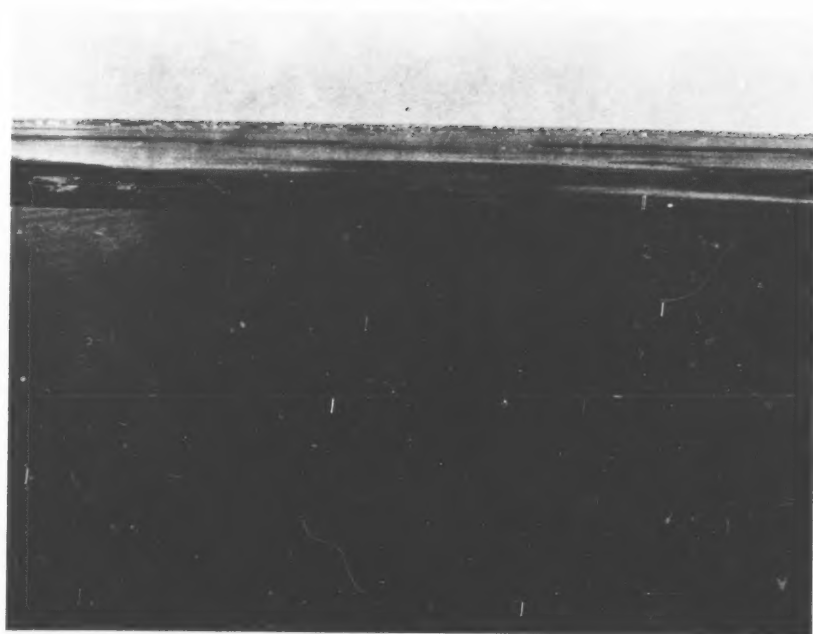


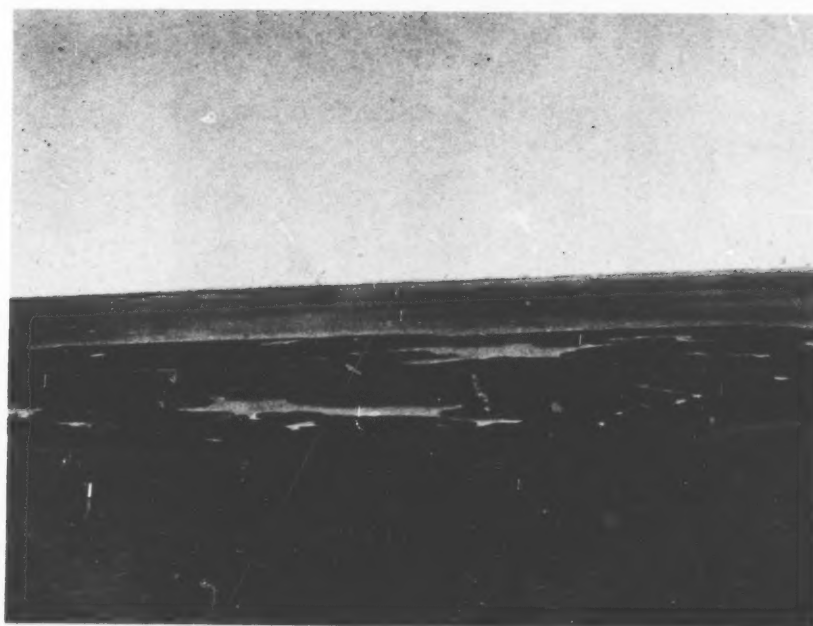
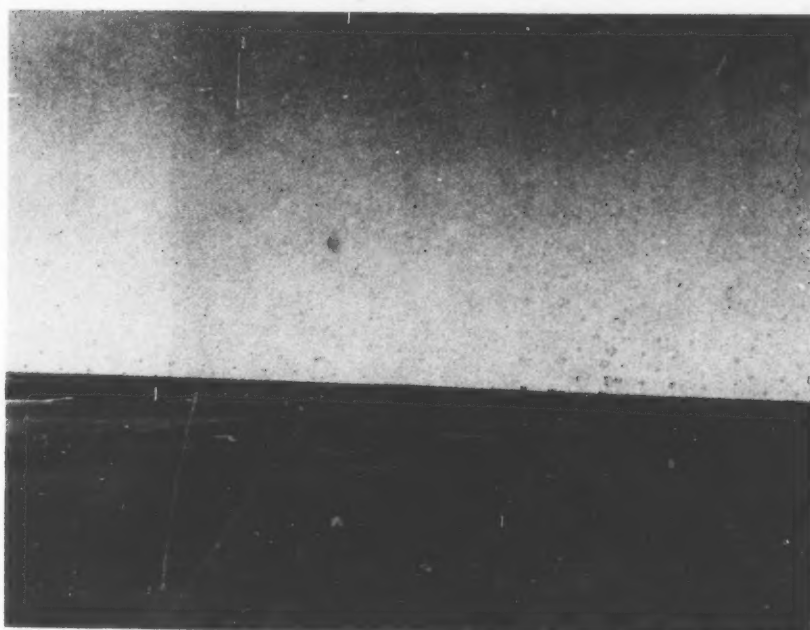


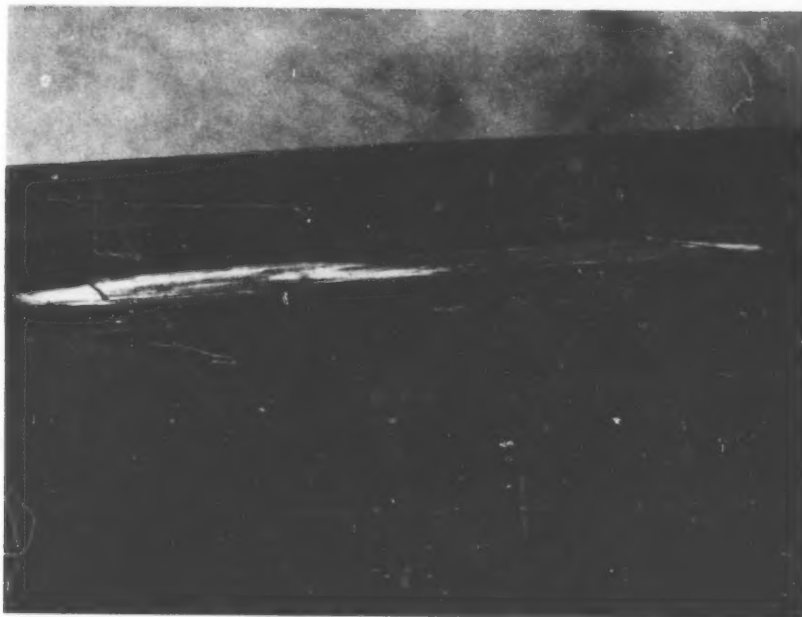
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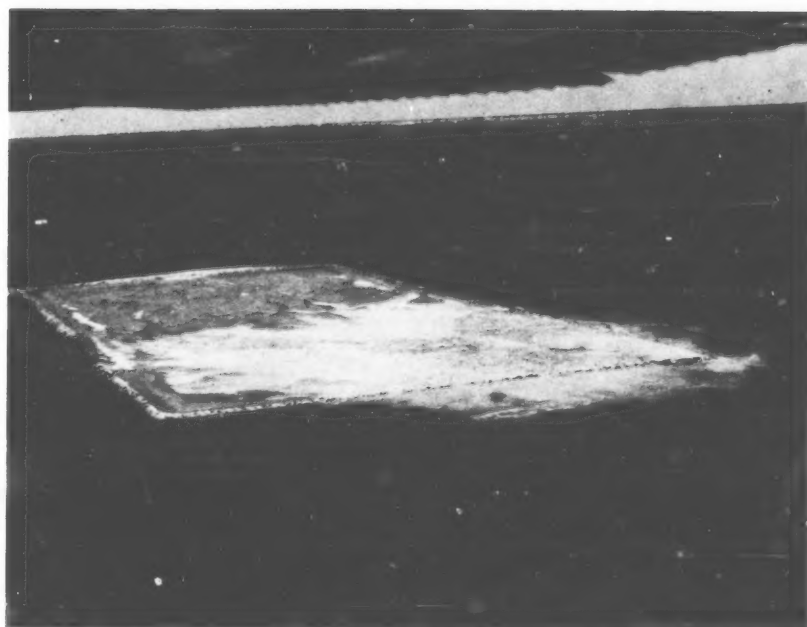


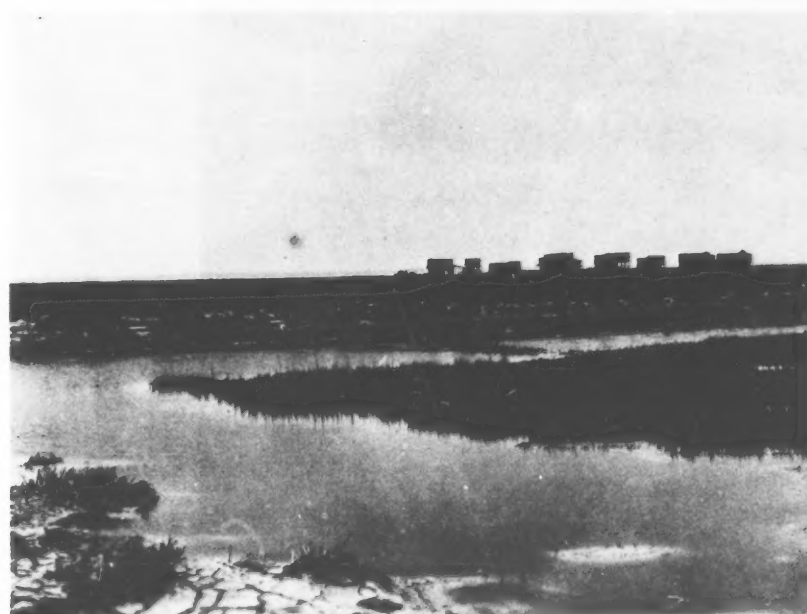




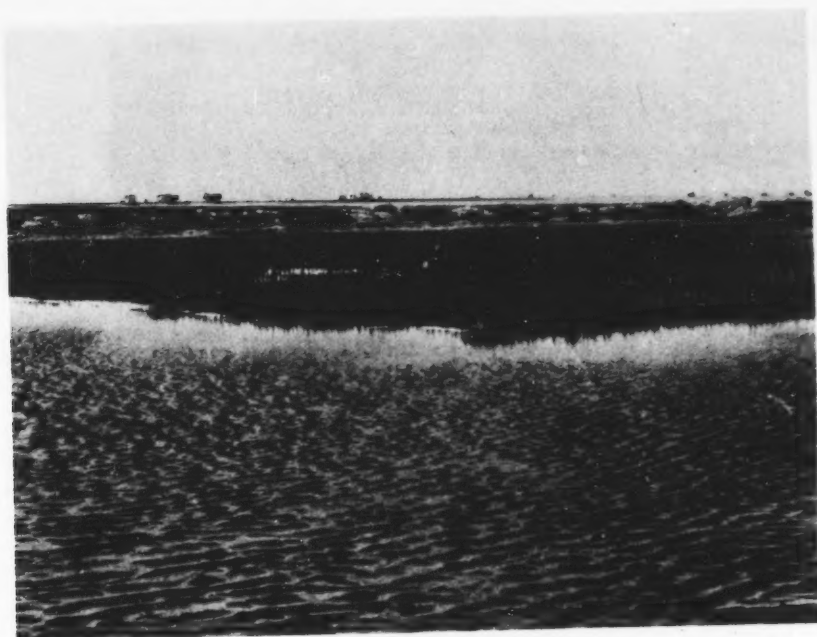


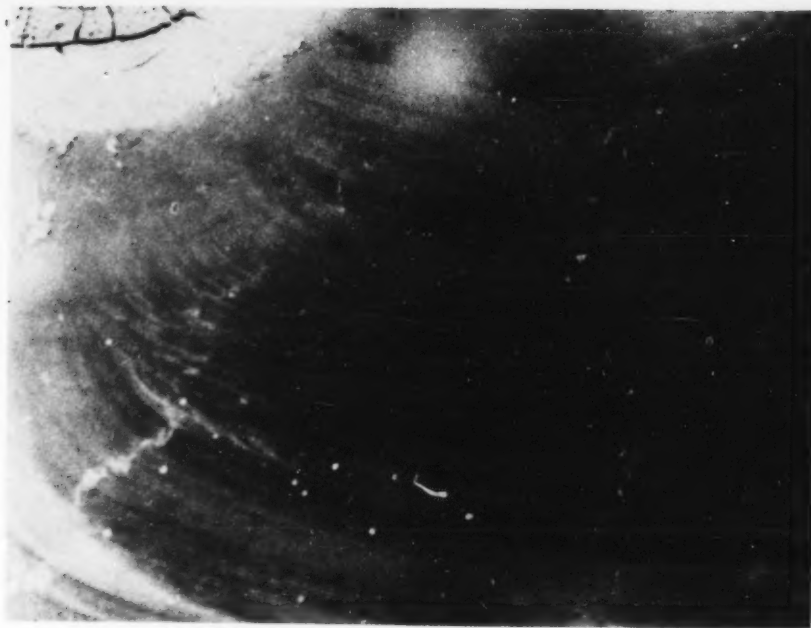


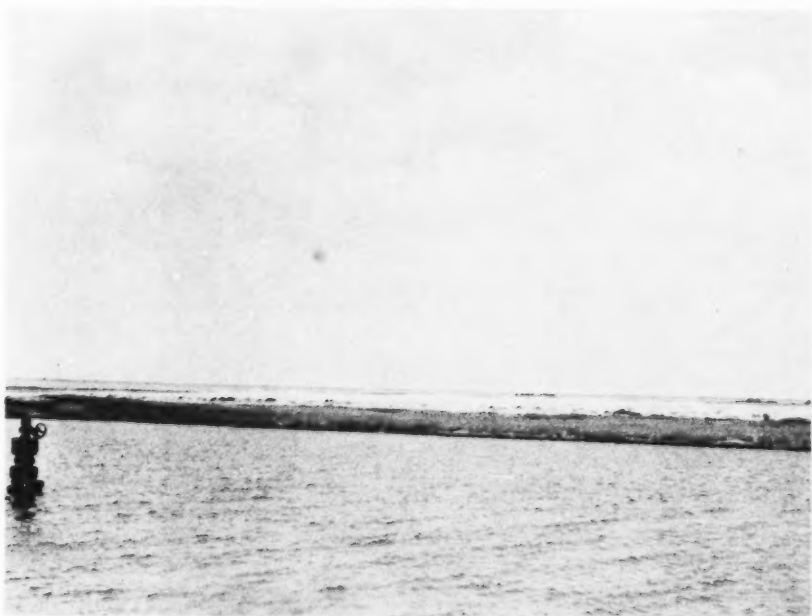
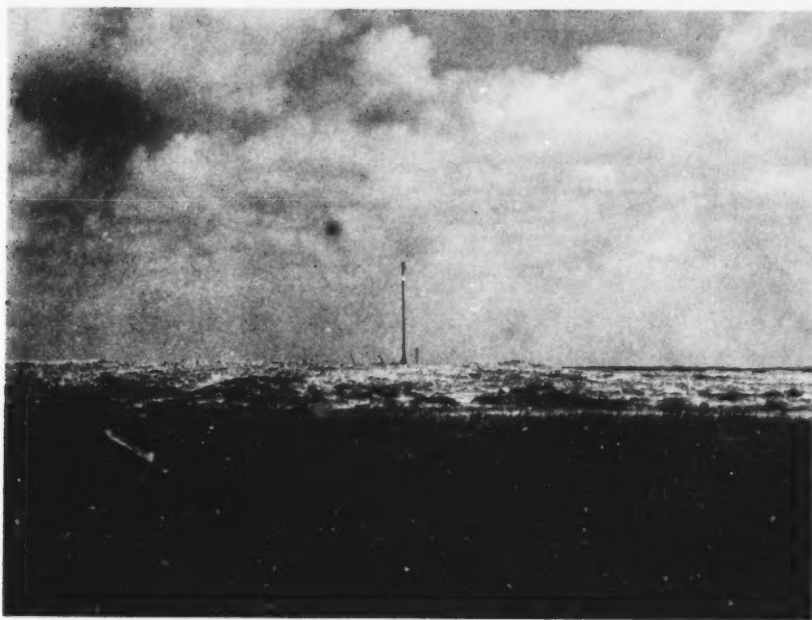


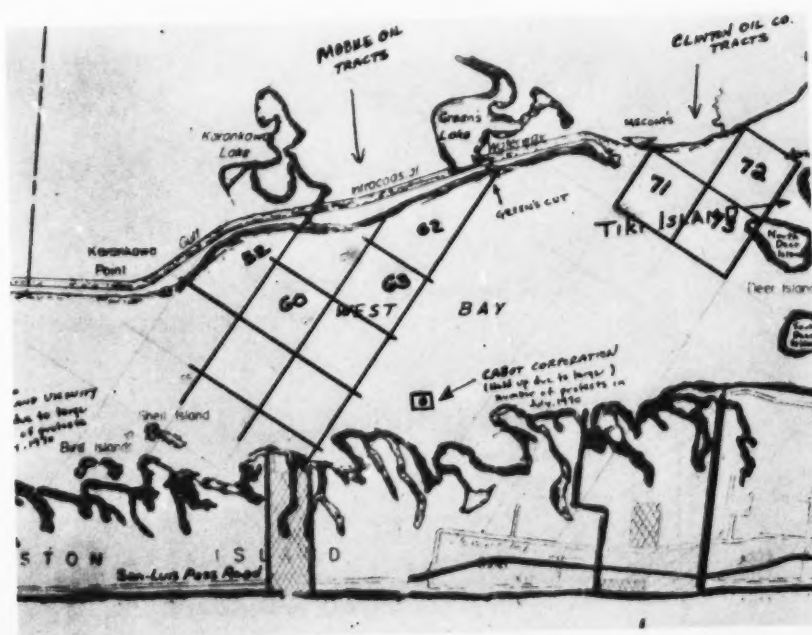


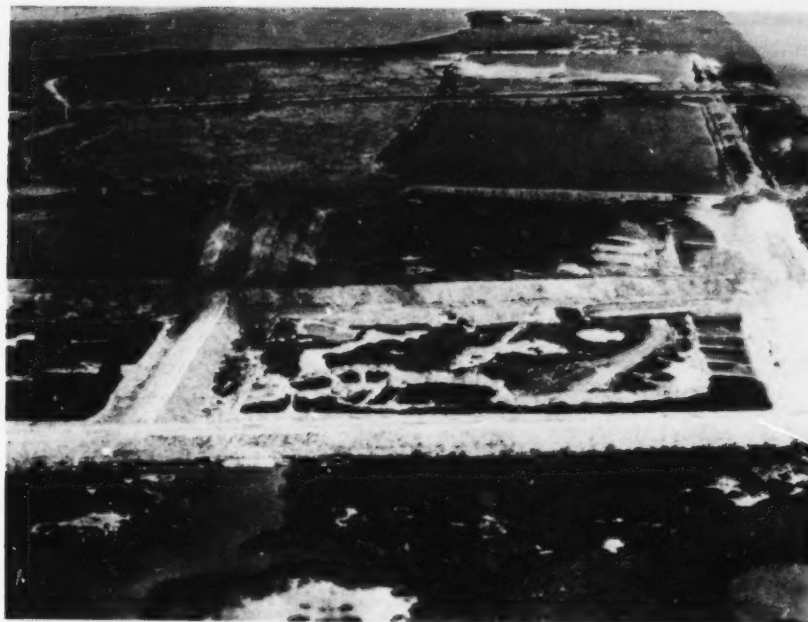
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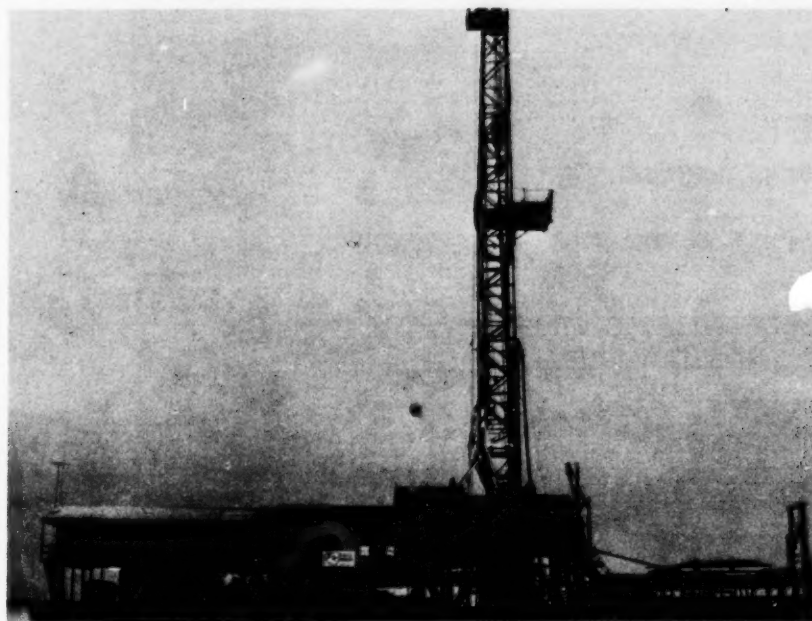
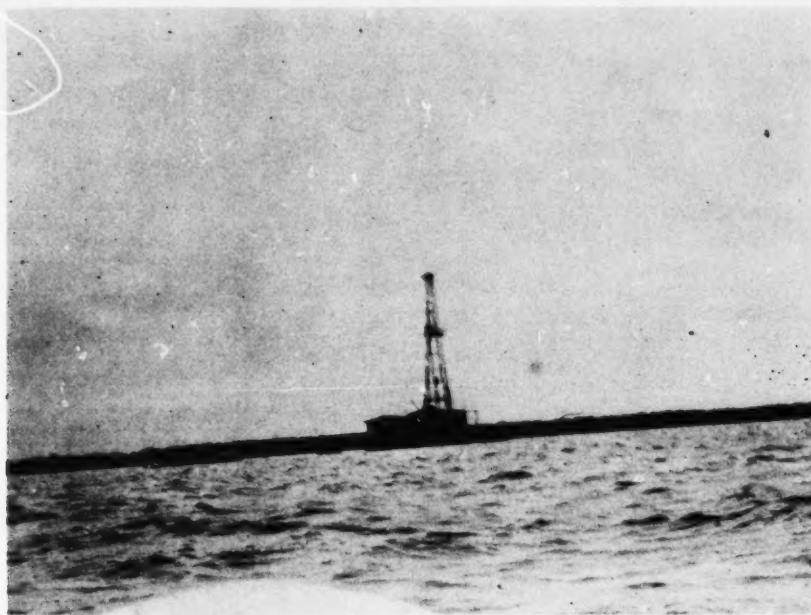


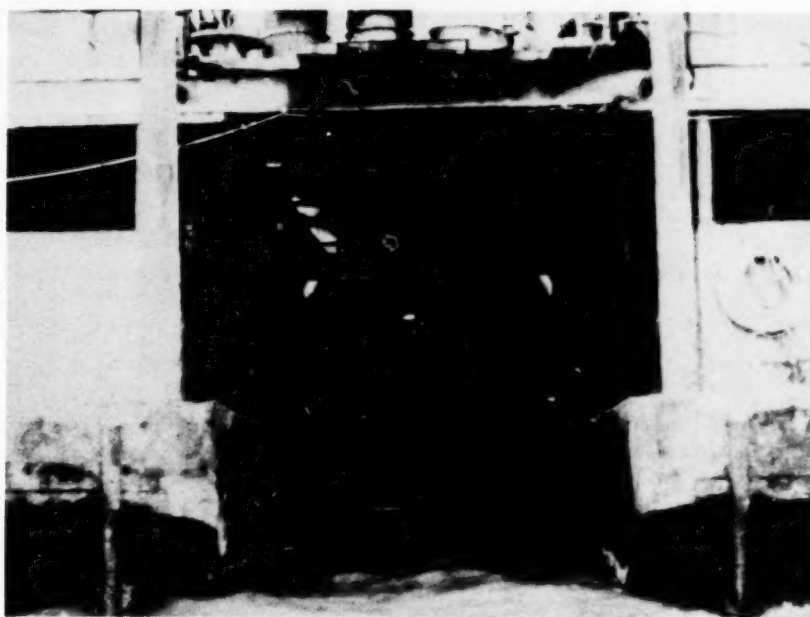
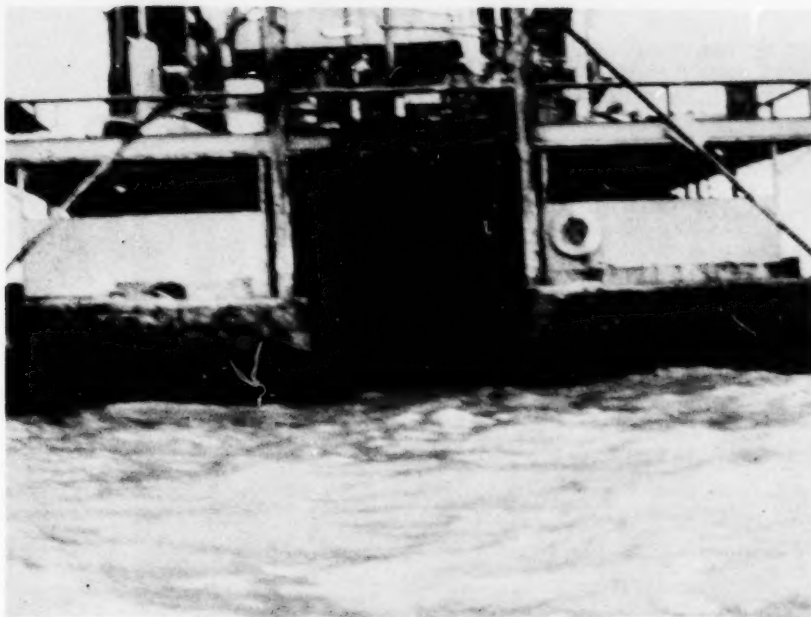






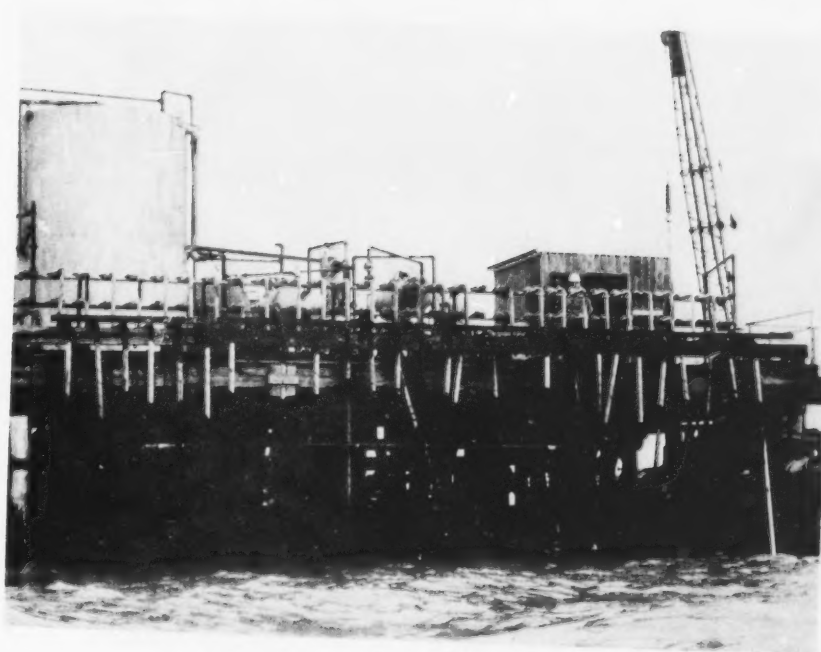
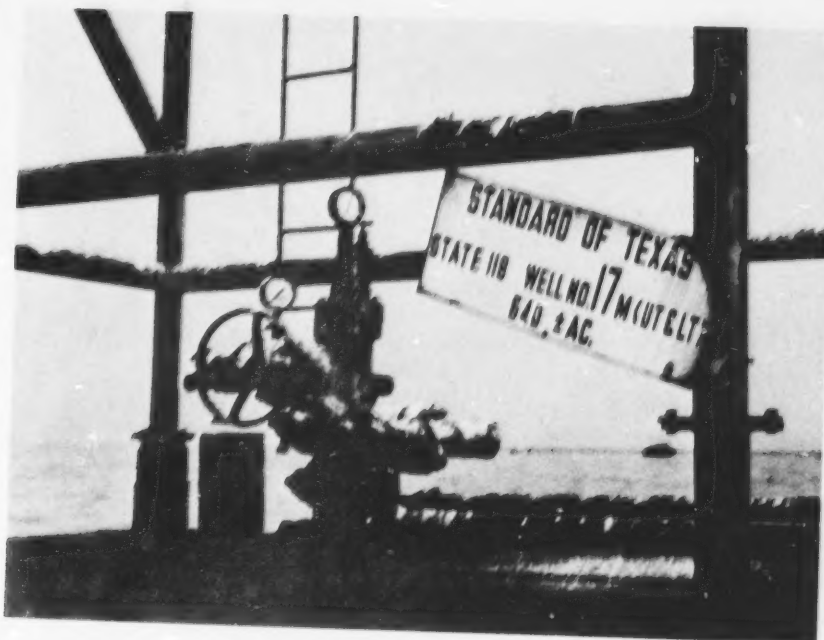
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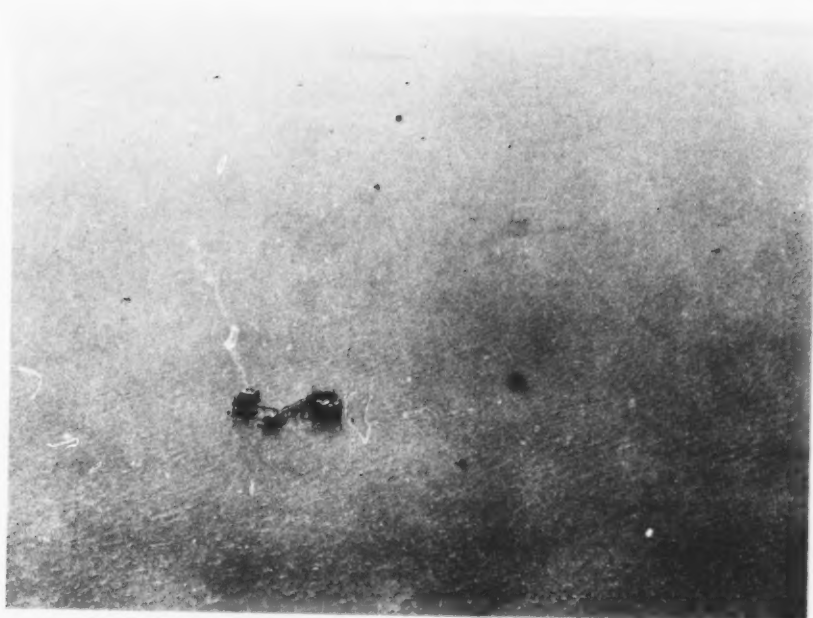
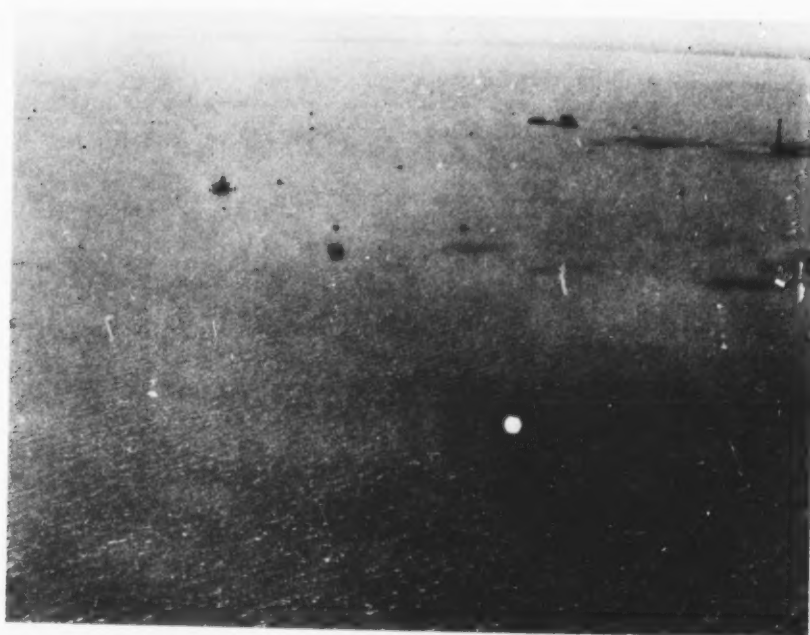




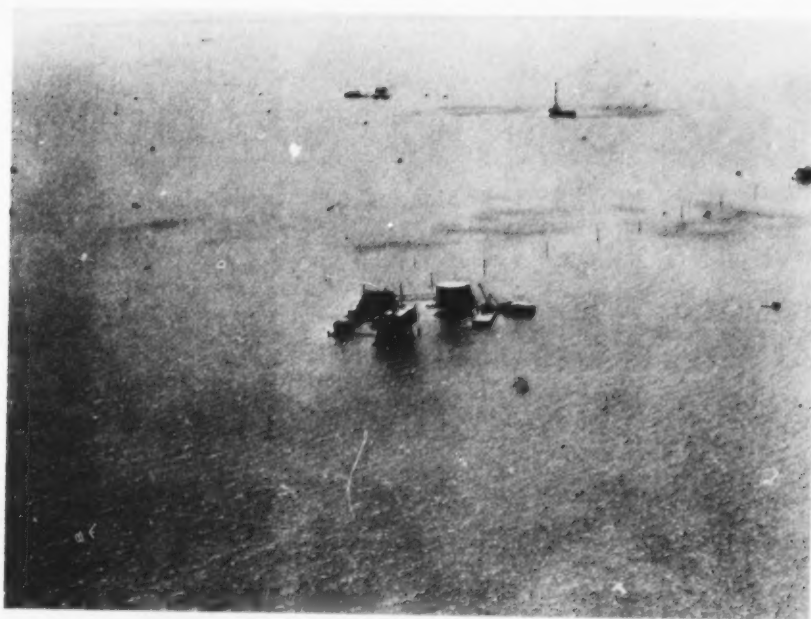








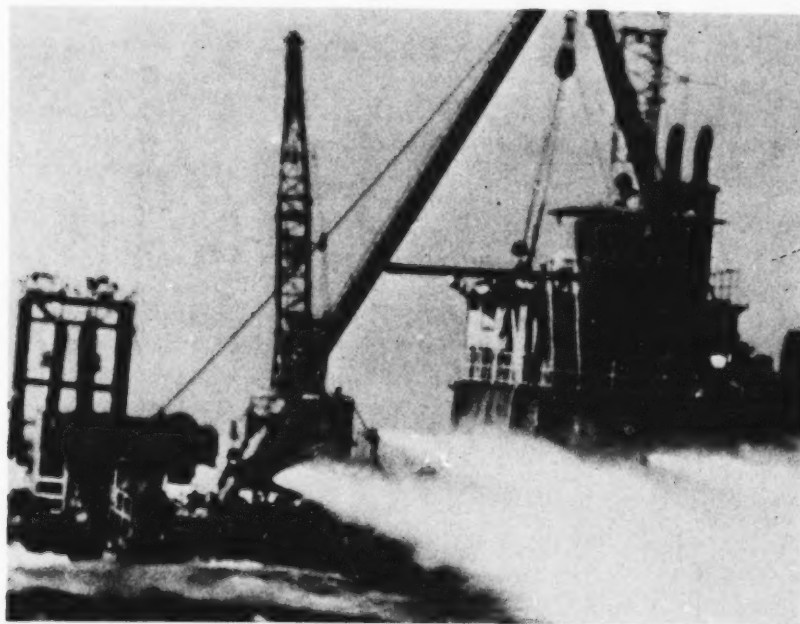
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G. Hagel

MR. YANTIS: As you are taking your seats, those names I call who are not here, I will call again at a later time, probably tomorrow. They will have an opportunity to be heard, although I would imagine if there ever comes a time when there is simply nobody here who wishes to speak, we will adjourn even though someone was planning to come later. But, that is up to Mr. Stein.

CHAIRMAN STEIN: Let me make an announcement on that. If we run out of witnesses tomorrow, we are going to adjourn, at least for the public witnesses, because presumably we have a lot to discuss.

MR. YANTIS: Mrs. John Madox, also lovingly known as the Mayor of Manchester. She is not here.

Mr. George Hagel of the Sierra Club has a brief presentation. I had promised him he could be on at the same time as the previous Sierra -- a personal presentation, although Mr. Moore is a Sierra Club member.

MR. GEORGE HAGEL

PRESIDENT, SIERRA CLUB

HOUSTON, TEXAS

G. Hagel

MR. HAGEL: Thank you, Mr. Yantis.

In connection with Mr. Moore's statement on behalf of the Sierra Club Task Force on Galveston Bay, this Task Force is under the chairmanship of Howard Peacock. In his behalf, I have agreed to read a statement as the Chairman of the the Houston group of the Sierra Club Task Force on Galveston Bay. The Sierra Club appreciates this opportunity to testify. Mindful of the distinguished persons who have addressed you in the past 2 days, we will forego a recitation of lists and statistics compiled by the Task Force for more than a year and confine our testimony to several conclusions.

An obvious conclusion is that Galveston Bay cannot survive as a viable environment organism if the present assault upon it continues. Well over a million people and well over \$1 billion worth of industry are engaged in activities each day -- in many cases, 24 hours a day -- that produce pollution for Galveston Bay, particularly its eastern reaches -- an area that also drains the Trinity River after it has drained the runoff of oilfields and the chemical

G. Hagel

wastes of farmland for more than 200 miles. Against this combination of population and industrial might, a relatively few people are matched; they write letters of protest, try to vote right, try to talk to officials who have influence, and try to organize cleanup parties. It is an uneven match.

Another conclusion is that we do not know whom to trust. Government at all levels has been guilty of maltreatment of this great estuary. Neither the spirit nor the letter of the law has been served. To local governments, Galveston Bay is a handy place to spew sewage -- a shallow place, but handy. State government sets flaccid standards of quality and even relaxes those standards when major industries and big labor bristle at enforcement. A recent Governor of Texas illustrated the technique of success in Texas politics at the expense of environmental quality. To a powerful State board designed to regulate if not reduce pollution, he appointed the top executive of a Ship Channel industry that repeatedly was named "Polluter of the Month" by the Houston Post. That former Governor has

G. Hagel

now risen to the highest councils of American political power. It is little wonder then that the Federal Government must share the blame for the poisoning of the bay; it has simply been too slow, too confused, or too wary of political implications up to now to help in defining and alleviating pollution problems.

We cannot trust the professional environmentalists. Almost all biologists, ecologists, and environmental chemists are on the payrolls of industry, government, or the universities -- and in some cases, all 3. And because of the hard and discouraging realities of our economic and political makeup, they are constrained from recognizing and protesting wrongs. (Laughter.)

Professors of biology and ecology should be the natural leaders of movements, such as one to save Galveston Bay. But if they are activists at all, we find that they are employed as consultants and apologists for Ship Channel industries or associated with other institutions that will not tolerate the kind of criticism and action that are needed. Instead of leading this fight, they have turned

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the field over to volunteer citizens. When the volunteers become too vocal, or generalize too much, or even give up tax exempt status to lobby for the salvation of a natural wonder such as the Grand Canyon then the professionals speak, but mostly in criticism of the excesses and inaccuracies in the language of the volunteer conservationists. Too bad about the professionals; we really need them.

Can industry be trusted? Evidence and tradition overwhelmingly say no.

Can universities, dependent in the extreme on political grants and industry-based bequests, be trusted? Their dependence itself suggests no.

Can the communications media be trusted? Houston newspapers, for example, do a generally good job of reporting environmental news, and there is one genuinely outstanding environmental writer here -- Harold Scarlett of the Houston Post -- but almost invariably the same newspapers, dependent upon established power for advertising and for other reasons, endorse and help elect to high office men who

G. Hagel

are either indifferent to or contemptuous of the conservation cause.

The Task Force sees no real cause for hope in saving Galveston Bay. But all who deeply care about estuaries and the richness and diversity of life that they represent must continue to try to help solve these problems. Let this testimony close then on 2 suggestions for constructive action:

- 1) Invest some money and faith in environmental teams of young people. Moving at will, a team would sample water, soil, air, the conditions of life, using public school or university laboratories; as a group it would confront the owners and managers of polluting firms, those who provide the capital, city councils, mayors, county judges, commissioners, Congressmen, newspaper editors, television station managers, and anyone else possessing power to do something for -- not about -- Galveston Bay; the team would be prepared to resort to legal process against polluters and litterers; in effect, a team would take drastic measures, and know a lot about what it was doing even though mistakes would be made. Each team would include college, perhaps

G. Hagel

graduate students in the fields of biology, chemistry, political science, law, and the communication arts. The Task Force realizes this is not a wise idea, but wise ideas generally come from the generations that have despoiled not only Galveston Bay but great expanses of the earth. Unknowing, untested teams of young people might be worth a risk; certainly they could do no worse.

2) Among the major crises of Galveston Bay are the hundreds of separate forces directly affecting it -- government bodies at all levels, industry, developers, sportsmen -- and the lack of effective authority for dealing with problems they jointly or individually create. Any one of the affecting forces can virtually negate progress being made by others. Therefore, if this distinguished panel can formulate a workable system for managing the quality of Galveston Bay, it will have achieved a tremendous victory for wildlife, for recreation, and for the preservation of a priceless natural resource.

Thank you.

MR. YANTIS: Thank you, Mr. Hagel.

G. Hagel

I think you presented some good ideas. I think both of you brought out that there is today, and perhaps there has always been, a competition of ideas. There is now today more than ever before a competition for resources and the use of those resources.

In the long run, the decision will come about through the political processes, people voting and those people who have been elected voting in turn.

I don't believe that anyone can or should predict on any given issue what the answer is going to be. I think the only thing the government owes you is a careful hearing and a careful evaluation. This I think our government will always give you. You may lose, but you have a right to speak. Someone else may lose, but they have a right to speak.

But, I think in response to Mr. Moore's request that I say what I would do about oilwell drilling in Trinity Bay, I will say that I can't tell you that; I don't know. I haven't seen the facts. I haven't heard all sides, and there are other sides. I think this is the salient feature to keep in your mind, although it makes you uncomfortable, and it

J. Walker

makes me uncomfortable. Our government, in its essence, makes its decisions through the competition of ideas, and it is that competition that creates occasionally dissension. But it also is a very effective decision-making process and one which is rarely used in places like Russia. (Laughter.)

MR. YANTIS: Our next speaker will be Jack Walker of the Rod, Reel and Gun Club.

MR. JACK WALKER, PRESIDENT
BAYSHORE ROD, REEL, AND GUN CLUB
BAYTOWN, TEXAS

MR. WALKER: Thank you, Hugh. I appreciate the opportunity to appear before this group.

Presumably we are here to do something about Galveston Bay. And as I read the newspaper and the television publicity associated with it, one of the things that we were going to do in this conference was decide about the closing of the Galveston Bay to commercial harvesting of shellfish, and perhaps other fish.

Now, there has been a lot of testimony concerning this, and I presume this has been resolved.

J. Walker

As I understand, however, we are going to have a party tonight and copious partaking of these fine foods produced in Galveston Bay. That, I think, will have Mr. Stein and the other members of the EPA retract the statement if there is any considering of closing Galveston Bay to the harvesting of shellfish. If such is not the case, I will be glad to refute any such arguments that such action should be taken.

What you have done has wronged a number of the poor oyster fishermen and producers in the area. I think at the conclusion of this conference the EPA is obligated to make a statement retracting the assertion that our shellfish might be harmful for consumption by the public.

Now I have heard a number of things this afternoon; one having to do with the Galveston Bay Study. This was brought up by Professor Busch. I had discussed this with Professor Busch personally. I happened to be associated with this Galveston Bay Study and I want to say that I am in wholehearted support of the Galveston Bay Study. It is a research effort. You and I can stand up here and talk about

J. Walker

opinions; whether you ought to do this or you ought to do that. The only way that we will really know what we are doing is to collect data and make decisions based upon sound data and not just upon opinions. That was the purpose of the Galveston Bay Study, and I think it is doing a wonderful job.

Another reference has been made to the Gulf Coast Waste Disposal Authority. Again, I worked with Senator Cole when this was passed in the legislature, and I want to say that I wholeheartedly support the Galveston Waste Authority. It had only one purpose, and that was to make it possible for small industries, small municipalities, or small communities to join together to make it financially feasible to build proper waste disposal treating facilities and pay a fee for the treatment of their effluent. Unfortunately, some other things that have occurred since this bill was passed have not always met my approval, but I certainly think the idea is sound.

Now the EPA's coming into Houston -- certainly created a ruckus when they first got here.

J. Walker

Seemingly things have settled down somewhat. Maybe we can get down to working out some of the problems.

These gray hairs in my head or part of them have been put there by dealing with problems associating with Galveston Bay. I probably have spent more time in Galveston Bay than any person in this room. Since 1936, I have lived in Baytown and I have spent many, many hours shrimping, fishing and oystering in those waters.

Mr. Moore made a passionate plea here about oilwells in Galveston Bay, some of which I agree with and a lot of which, I don't. He pointed out, Trinity Bay and Galveston Bay have a number of producing wells. These wells have been in operation for many, many years. Some damage has occurred because of their operation, but this has been a minimal sort of thing.

Some of the good fishing in that area was actually done right off the structures that you saw photographs of, and that is still true today. Some of the channels that have been dredged to go to the structures -- if you pull a shrimp trawl down these channels, shrimp gets down into the deeper

J. Walker

holes and many people, including myself, use those channels for catching your shrimp. To my knowledge, there has been no real damage to the marine life of Galveston Bay because of those oil drilling operations. It might be unsightly and you might not like the looks of them, but to be all factual, there has been very little damage to marine life.

I want to point out to you that I don't have a penny involved in the oil industry. I don't have a penny involved as far as commercial fishermen are concerned. What I am saying doesn't make a dime's worth of difference to me as far as money is concerned. But I think the devil should have his due, and I say that when an industry such as the oil industry has been pointed out for this conference saying they have done tremendous damage, I don't believe the facts will back that up.

Now, I want to make another statement concerning pollution load in Galveston Bay. One way you can look at it -- there are 3 different ways -- I can outline -- first, you can set the standards so high that municipalities or industry couldn't

J. Walker

operate in this area. There wouldn't be any jobs, and we would all have to look out and, well, solve our problem. But we would have nice clean water. I don't think that would be desirable.

You go to the other extreme and say, "Let's everybody do what he wants." As individuals, we are all pretty filthy, including myself. You only have to go on a camping trip to see how much waste each of us will generate over a weekend. So, if everybody did everything they wanted to, then we would all probably die of some sort of disease. That extremity is not feasible. The only feasible way that I see is to draw some line of saying how much pollution load the area will tolerate. This is where Hugh and the Water Quality Board have gotten into difficulty. Any time that you commit yourself, and then draw the line and say, "Well, look, we can tolerate so much," then you have committed yourself, and you are subject to criticism.

I submit to you that if we put drinking water in Galveston Bay, all the industries and all the municipalities, the marine life in Galveston Bay, would immediately go down. I think that it is a fact

J. Walker

that any biologist will tell you. Unless they have the nutrients put in there by the organic materials to some extent, then your marine life would decrease.

The biologists who come into Galveston Bay and start sampling it that are not familiar with the area are utterly amazed at the movement of marine life present. Present because of the vast food supply that is supplied by the pollution. Now we are overdoing it. That is the problem. We are putting too much in it. We are overfertilizing it. But I submit to you that you are going to have to draw some lines. If you went too far and say you didn't put any in it, that would be disastrous. If you put too much in it that is disastrous. So, it is my contention that some is justified and that's where the Galveston Bay Study -- I see Frank Bender sitting here; I hadn't seen him previously. The study is to determine what this load should be and draw these guidelines as to what the area will tolerate.

I am sure that Hugh Yantis, Carl Bender, and the rest of us will readily admit that the load, the present load, is too much, and efforts are being

J. Walker

made and progress is being made to reduce that load. How far should it be reduced? I don't think there is a person in this room that has got the information on where you should stop and where these lines should be drawn. Hopefully, as the study progresses to its conclusion we will have a better knowledge of where these lines should be drawn.

I am again reiterating that the Bay Shore Rod, Reel and Gun Club, Inc., located in Baytown has been in this business since 1955. I have attended conferences here in Houston, Austin, Washington, time and time again. I get rather discouraged. Not much progress is being made. But to criticize Hugh Yantis and the other State officials that they haven't done anything is not the correct approach. I am not always in agreement with them, but generally these people have done a fine job. I would certainly hate to see that this conference should go and say that I have heard some pretty harsh words about these people -- and I know that they have been dedicated, and under the circumstances of the political situation, they have done a fine job.

J. Walker

With one final thing I will finish up here. I heard representatives from industry this morning give us this glowing account of what they are doing and how they are spending a lot of money. But a lot of money is spent in this area. Listen to the corporate policy as outlined by these industries. You can find no fault with it.

The thing that I resent, and call a spade a spade, to you fellows -- I talked to many of them -- it is not their public utterances such as this that I am perturbed about; it is some of the things that occur that are not public.

Any of you who have been involved in going to Austin during the session of the legislature trying to promote good conservation measures or get appropriations for the Water Quality Board will run into industry lobbyists. They are always present in the background, and they exercise far more influence than any of these nice public utterances, that we hear for the newspapers, might indicate.

Many of the difficulties that we have -- and Senator Cole had all sorts of difficulties in getting the laws creating the Texas Water Quality

J. Walker

Board passed by the legislature -- and despite the fact that the corporations will tell us, "Look, we are spending millions of dollars and we are all for doing all of these jobs," back in the background, they have got your members of the legislature, through their organizations and their lobbyists, and are giving them a little different story. And these are the things I know exist. You know they exist. It is not very popular to stand up in a public forum and state them. But you know that it happens, and I certainly through the years have run into this.

Now, there are 2 or 3 suggestions that I would like to make to the EPA for some actions that I would like to see them take. One of the things is about industry's reuse of water as far as the treating of effluents is concerned.

It has been our policy in this country to use new materials such as iron ore, etc., rather than melt down old automobiles; to get the supply of water from a source such as the Trinity River. The high cost of treating municipal sewage could largely be offset if the water, after the solids were

J. Walker

removed, were reused by industry for their cooling purposes. I see no reason in running 100,000,000 gallons or more a day of water down the Houston Ship Channel which could very well be utilized by industry in their cooling purposes. In fact, under the quality of the water for these cooling purposes would probably exceed the water in its natural state from the rivers themselves. The solids would be removed. Probably you would have a bacterial amount up, but it would make no difference as far as cooling purposes.

Another thing that could be done that I think offers some possibility is aeration of the Houston Ship Channel. Some of this organic material that goes down the channel -- if we put in an aeration system, some sort of blowers where oxygen could be pumped into it, I think we could largely dispose of the organic materials that are now getting into it.

These are possibilities.

Another area that needs to be looked into as far as Galveston Bay is concerned is the herbicides and pesticides that get into the bay from the Trinity

J. Walker

River and from the rice operations along in Chambers County. I know for a fact that there is very little control on the airplane spraying of these various pesticides, and I think this is an area that the EPA could very well look into.

Thank you.

CHAIRMAN STEIN: Thank you, Mr. Walker.

(Applause.)

I don't want to deprive you of that.

(Laughter.)

MR. WALKER: I doubt if I would have gotten any (indicating). (Applause.)

CHAIRMAN STEIN: I have to make it clear what the record is.

One, I go back to Mr. Yantis' remarks after the previous speaker. There are many ideas put forward by various people, and we haven't heard them all yet at this conference. The conferees have to evaluate the facts and try to work their way through and see what is to be done.

One, certainly about the oil wells and oil drilling in water, which as we all know is a very

J. Walker

serious problem. The other problem -- and I think we have to make a judgment in Government -- the previous speaker at one time referred to us as honorable people, and the next minute he indicated maybe he didn't trust us.

Let me give you a thought. I think the Government belongs to the people. It is your Government. Again, we are not the Russians or foreign aliens, and we represent you. You can do what you want with the Government, and the final analysis you are going to get is the kind of government you want.

I want to make this clear. There are a lot of people here representing certain industries whom I know from having worked toward solutions on previous cases. But the point is that while we may have philosophic ideas, and goodness knows I have many, and I may have philosophic differences with Mr. Yantis, I think that under the American system (a system of laws) as we sit at this table, if we don't trust each other to work this out, there is no point in sitting here.

J. Walker

The notion of equating or trying to equate a difference in philosophy or a difference in approach with someone you don't trust, someone following governmental practice whether it be in Federal-State relationships or going to court, is taking a step into an abyss. This is the basis on which we are asking. If we don't have this trust and they say they don't have the same kind of trust for the presentations we have here, we might as well adjourn this conference and go right home now.

I ask you to join with us and try to work this out in a spirit of trust. But, sir, if we are going to be honorable men, if we are going to consider all the aspects, there has been a question raised by a Federal investigator concerning the quality of shellfish here.

Now no one recognizes more acutely than I do that of all the people who have been named as dischargers in the Federal report, I don't think anyone has lost a penny's worth of business because they have been named in that report. If anyone has been hurt, it has been innocent bystanders such as

J. Walker

the people engaged in the shellfish industry here. Nevertheless, there has been a suggestion we look beyond the closed areas to other areas in regard to the quality of shellfish. This question is still on the table. I don't know how it will be resolved. The very fact that I or some of my colleagues may join some other colleagues for a shellfish dinner does not mean we have resolved the question on the basis of going to that dinner. That question is still open. I say this with no prejudice either way. We all maintain an open mind.

MR. WALKER: Thank you, Mr. Stein.

I would like to say this. I have been an analytical chemist for some 34 years of my life. I know of no evidence that any court in this land, in my opinion, would accept if such a ruling should come about that you would say or any agency, whether it is the EPA or anybody else, would say "Close Galveston Bay to shellfish production for human consumption." I know personally there is no evidence existent that would warrant such drastic action.

In my opinion this sort of thing is rather

J. Walker

moot. In the first place, I don't believe at the conclusion of this thing that you will come out with that recommendation. But in case you did -- and that is certainly your privilege -- I am certain that it would have to be litigated. In my opinion there is no such evidence available that would be acceptable in any court in this land.

MR. STEIN: I appreciate your point of view.

I think the answer to the point you gave is that regardless of possibly philosophic differences among the Federal establishment, State officials, industry, or municipal officials, I have never found a case within our system of government where we could not work out a solution acceptable to all -- we could not move ahead and go ahead with it.

As a matter of fact -- on these trips I sometimes get up earlier than usual and watch TV, something I never do at home -- I saw two Houston educators on national TV this morning talking about a possibly much more difficult problem than the one we have. They have arrived at a solution for the

B. Clark

school system and they are moving forward, whatever you might think of it. I think possibly when you compare the problems most people have with the one we have here maybe we have a simpler one. If they can come up with an answer, I believe we can come up with one too.

MR. WALKER: I am sure you will.

MR. STEIN: Thank you.

MR. WALKER: Thank you.

MR. YANTIS: Thank you.

I don't know if the next speaker will be the last one for the day or not because I don't know how long he wants to speak. But Bob Clark has asked for time to speak on behalf of Senator A. R. Schwartz.

MR. ROBERT D. CLARK

REPRESENTING THE HONORABLE A. R. SCHWARTZ

SENATOR

AUSTIN, TEXAS

MR. CLARK: Just 30 seconds.

MR. YANTIS: All right.

MR. CLARK: Thank you.

B. Clark

I am Bob Clark. I just came to present the State of Texas Joint Report of the Interim Committees on Pipeline Study and Beaches to this hearing for the record. The committee itself entitled the report "Pollution Versus The People." I want to present a copy for the record and a copy for each of the State agencies.

Thank you.

MR. YANTIS: Thank you, Bob.

MR. STEIN: May we accept that as an exhibit?

MR. CLARK: Yes.

MR. YANTIS: Yes.

Thank you.

[The above-mentioned report, marked Exhibit is on file at HQ, EPA, and Region VI, Dallas, Texas.]

Going down the list -- we do have at least 20 more minutes.

Is William Defante here? (No response.)

He is a commercial fisherman who wishes to speak.

L. E. Glass? Is he here? (No response.)

Most of these people were all here earlier but they had to depart.

A. Atkisson

T. L. Hillman. (No response.)

Mrs. Warren North. (No response.)

Mrs. North is a citizen.

Now then we come to the Citizens
Environmental Coalition. Three people are here --
Stewart Henry, Arthur Atkisson and Roland Bradley.
They spoke to me a few minutes ago.

Arthur Atkisson.

MR. ARTHUR ATKISSON, PRESIDENT
CITIZENS ENVIRONMENTAL COALITION OF
SOUTHEAST TEXAS
HOUSTON, TEXAS

MR. ATKISSON: Thank you, Mr. Yantis.

Mr. Stein, Mr. Vanderhoof, I am Arthur
Atkisson. I must say that I am kind of a reluctant
witness, in response to some of the comments, because
all of my books are on air pollution, not water
pollution. So, were it not for my role as president
of this organization, I would probably not be here
today.

However, Tuesday night a group of our

A. Atkisson

general assembly visited me at my home with a tape recording of much of the testimony that had been given at this hearing. After hearing that testimony, I agreed to come before you today with the prepared testimony that has now been distributed to you.

Like most citizen groups in this area, we applauded the announcement that this conference was going to be held.

We believed at that time it would provide an opportunity to clear the air on this subject; that it might provide a factual foundation for public and governmental dialogue concerning the future steps addressed to pollution problems in the Houston Ship Channel and Galveston Bay; that it might signal the birth of a vigorous, enlightened, responsible, new intergovernmental effort to cope with water pollution problems in this area. Frankly, I am now wondering if our initial reaction to the announcement of this conference was correct.

Like many other observers of these hearings, I have been appalled at the acrimony shown here and at the defensive and selfserving nature of much of the

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testimony. Thus far in these proceedings the intelligence and goodwill of water pollution control officials in this State has been questioned not by Federal officials but by Texans of reputation. Conflicting testimony on the facts of pollution discharges and trends in the Galveston Bay has been introduced into the record. The motivation of the Environmental Protection Agency in calling these hearings has been challenged by State Pollution Control Officials. And I had assumed from your last comment, Mr. Stein, this meant that deep wedges have been driven into what we had earlier hoped was a narrowing gap in the timbers of intergovernmental and interjurisdictional cooperation in water quality improvement programs. The architects of the water quality standards applicable in this area have themselves rejected, at least on my tape recording, any implication that these standards have any significance to pollution control policy, to the design of pollution control programs, or to legal steps leading to pollution abatement. We have heard confusing State-sponsored testimony concerning the significance of petroleum-derived hydrocarbons in

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marine environments and a suggestion that control of 2-cycle outboard motors should be given high priority as a means of halting oil films in recreational waters.

If in the minds of the general public the facts about pollution in the Houston Ship Channel and Galveston Bay were confused before the conduct of these hearings, they are even more confused now. The low level of confidence displayed in recent months and years by the public toward its official water pollution abatement and environmental control agencies has sadly sunk even lower during the conduct of these hearings.

What now prevails outside this hearing room is a general public mood of depression, pessimism, confusion and almost utter lack of confidence in the reliability of water pollution data from almost any source.

I do not wish to contribute to the worsening of this already horrible situation. (Laughter.)

As president of a coalition of more than 40 civic, professional, trade, and labor organizations, I will, therefore, confine my comments to the one

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matter on which I can speak with some confidence -- that is the current mood and interest of the general public in these hearings.

In doing so, I hope that I can help clear the air and provide some basis for new and much-needed intergovernmental programs to deal with problems of the South-East Texas environment.

First, I would like to deny categorically that the ecology movement in this area, as suggested by some, has been prompted by eggheads, troublemakers, do-gooders, or by individuals hell-bent on the destruction of the Republic, apple pie, and the virtues of motherhood. (Laughter.)

Quite the contrary! For example, the members of our group come from Memorial Drive and from Pasadena, from Westbury Square and from West University, from business and from labor, from academic life and from the professions, from the Republican party and from the Democratic. None of them wish to end the economic vitality of this area to halt the productive machinery of the Nation, or to turn the Houston Ship Channel into a bubbling

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brook used only for model boat contests by little children. We do not wish our pollution control officials, as the chairman of the board suggested the other day, to use "a sledge hammer to kill flies," but instead wish them to acknowledge the existence of the flies and the possible utility of swinging a fly swatter in their general direction from time to time.

Second, I would like to point out that programs which seem "sound, sensible, and practicable" to some responsible and well-meaning public officials may appear to be "feeble, fragmentary, foolish, and fatuous," to equally responsible and well-meaning citizens. It seems clear to me that such a situation now exists in this area.

Whether justified or not, to me, this is the critical point. It seems factually correct to state that, on the whole, the citizens in this area have lost confidence in the State and locally-sponsored programs directed at upgrading water quality in the Houston Ship Channel and Galveston Bay. In the long run, this lack of confidence may prove to be a far more important problem to our society and

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to our community than any environmental problem produced by continued discharge of waste products into the waters of this area. The restoration of public confidence in these very important programs therefore should itself be one of the matters to be soberly considered by the conferees at this hearing.

The restoration of public confidence was not well served by the presentations offered at this conference on Tuesday.

In a famous line, one of Shakespeare's characters said: "Me thinks the lady doth protest too much." A now-forgotten American said many years later: "Where there is smoke there is fire." Both statements I think characterize well the general quality of the public's reaction to State testimony at Tuesday's hearings. Testimony about the horrible consequences of outboard motor usage, the harmless nature of petroleum-based hydrocarbons, and well-turned phrases that evoke applause from an industrial audience are hardly calculated to inspire public confidence in officials of water pollution agencies.

Utterly imbalanced statements which suggest that environmental control programs -- if

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directed to avoidance of environmental degradation -- will lead inevitably to the loss of industry, jobs, homes, and population are hardly of the sort which can reassure citizens as to the orientation and motivation of their public officials. Such statements are strangely reminiscent of those offered for a period of nearly half a century by officials in West Virginia and the heartland of Pennsylvania when citizens complained of environmental degradation associated with strip mining, steel production, and other industrial operations. "Don't destroy the economy" was always the response to those who argued for some measure of protection of the environment. As it turns out the economy of that area was all but destroyed. It has become the donor area for a significant fraction of the Nation's net migrant streams for the past 30 years and is on the Fortune Executive Survey list as one of the least desirable places in which to locate a new business. This plight is a result not of too much concern for the environment but of too little concern. I would have hoped therefore, that the tales of doom

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consequent to vigorous water pollution control efforts might also have suggested the consequences which inevitably befall those communities which are inattentive to the protection of their environment.

Third, I would like to state as clearly as I can what I perceive to be the nature of citizen interest in the quality of water in the Houston Ship Channel and the Galveston Bay. As I suggested, on Tuesday evening a number of members of the coalition assembled at my home with tape recordings of some of the testimony offered in these proceedings. Not living on the Ship Channel, I asked the group: "What really troubles you about the pollution of those waters in the Houston Ship Channel and in the Galveston Bay?" The responses suggested quite the opposite from what some testimony suggested -- that none of this group seriously intends to ever use the Houston Ship Channel for recreational purposes. A consensus suggested that as long as the channel does not stink, as long as pollution in that waterway does not create tax burdens on the general public for dredging and other activities, the water quality in that channel

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can be as degraded as any one wishes to make it. However, the impact of pollution in the Ship Channel on the quality of Galveston Bay was a matter in which this particular group evidenced profound interest. However, when pressed they admitted that if industry and other polluters would financially reimburse those whose livelihoods depend on shellfishing in the Galveston Bay, maybe then they wouldn't be so concerned with the economic losses associated with shellfish in the bay. And so long as adequate public health safeguards are invoked to assure that the public is not endangered by contaminated shell food derived from that bay, then even our interest in commercial fishery resources was limited. But what was of real concern to all of the group was the impact of continuing pollution on the future utility of the bay and its shoreline as a recreational resource available for use by our burgeoning metropolitan population. As demonstrated elsewhere on this continent and abroad, the recreational potential of a water body can be destroyed or severely impaired even if this recommended quality of degradation falls far short of levels necessary to produce direct injury to public

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health. Whether oil films are "toxic" or not, they are damned unpleasant to those seeking a weekend rest from the stress of everyday life. This is what troubled me.

Yet another concern expressed by the group had to do with the integrity and sincerity of governmental pronouncements. There was unanimous agreement to the view that water quality and other environmental control standards should mean what they say -- that such standards should represent the serious, sincere, legally-binding commitment of government and should serve as the over-arching guides to the issuance of wastewater discharge permits and to the initiation of water pollution abatement orders. Moreover, there was a feeling that such standards should serve as the focus for governmentally-developed implementation plans which specify the time schedules to be observed in the achievement of these standards. Now I deduce from the comments of the group that much of the lack of confidence they feel toward governmental programs has to do with their individual doubts that government

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has any real commitment to the achievement of published water quality standards, and/or that any real time schedules have been prepared to guide regulatory activities aimed at the achievement of these standards.

One member of the group noted that Dr. Milton Friedman, a most conservative economist and advisor to the Nixon administration, has recently stated his view that private industry has no moral responsibility whatsoever to initiate voluntary programs to clean up its waste discharges. Friedman argues that the only moral responsibility faced by management is to produce maximum profits for stockholders. Friedman suggests that the moral responsibility for fixing environmental quality objectives and for requiring specific abatement programs rests with those institutions in our society which have been established to reflect the public interest and mood and to regulate our interpersonal and intergroup relations.

The argument is an interesting one and suggests that any failures in environmental control efforts in this country should be laid not at the door of private industry but at the door of government.

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Environmental quality objectives should be clearly stated by government, and abatement measures should be enforced fairly, uniformly, and equitably across the board against all polluters.

A similar comment was made not long ago by the Vice-President of Humble Oil and Refining Company. This individual suggested that one of the impediments to industrial pollution control efforts is the fear of competitive disadvantage that might result from unilateral, voluntary action by any one company to control its waste discharges in absence of assurance that all other competitors are going to invest similar sums.

The issue in water pollution control in this area, in my judgment, therefore, may be seen as involving confusion as to what the real water quality goals of government may be, and further uncertainty as to the intention of government to uniformly across-the-board enforce pollution discharge requirements.

In saying this I realize I have offered nothing to your distinguished body to help you resolve

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any technical problems in the Ship Channel or Galveston Bay. I hope you and others will understand my motivation in making these remarks.

The members of the coalition and myself prefer always to enter into any public issue with the assumption that we are dealing with men of intelligence and goodwill in this area -- men who may differ from us at the end as to any public policy objective at issue, but who, although sometimes shaky I must admit, will nevertheless seek to understand our position, our needs, and our problems. When the channels of communication between government and the public are blocked, when the respect of one for the other is impaired, then something tragic happens to the processes of democracy and to the working of our society. I am fearful that this is happening now in respect to water pollution efforts in this area -- perhaps because of misunderstandings and other factors that may have nothing whatsoever to do with the honesty, integrity or competence, and sincerety of individuals and institutions which now seem to be antagonists in an arena of continuing conflict.

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So it seems to me, therefore, that out of this conference should come a recommendation for a prompt and open dialogue and factual investigation which might lead to a restoration of public confidence in these programs, to an honest orientation of citizen-governmental dialogue to "facts" which all can accept, and to an honest and balanced consideration of the major present and future consequences associated with alternative levels of pollution control.

Thank you. (Applause.)

CHAIRMAN STEIN: Thank you.

Dr. Atkisson, I believe you made some profound remarks, but let me give you my view, after having sat through literally a thousand of these conference sessions.

I don't know what the feeling is outside the room. Maybe you can speak for all the people; I am not sure I can because I have been in the room most of the time.

I do believe the record here is a pretty good one. Now, it is certainly not the kind of record you would find in opening Euclid's book on geometry

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where you move on a logical progression from one theorem to the next. It doesn't move ahead like Dostoevsky's novel or a Beethoven symphony, but it is all there.

But I think if you look at the figures that the State gave and the figures that the Federal people gave, in my opinion -- and I have gone through them because we have to analyze this -- I feel they are in 90 percent agreement.

We also got a tremendous amount of information from the industry. Now I agree with your last statement. This has to be put in a form that will have the confidence of the people outside, but I think we have taken a tremendous first step in this record.

It seems to me what we have done in the past few days is assemble a body of data and points of view applicable to decision making in Galveston Bay that was not available in any single source before. I ask your citizen groups to look at it.

Now I just have one other remark, and I hope you won't take this too much to heart. I think

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the interest of your group is well understood, and I might say you don't solely designate this as what your people want. But your suburban, middle class bias is showing; you want these waters for recreation. Our obligation in Government, though, is 1) to consider that you want them for recreation, 2) that these fishermen want to make a livelihood from them, 3) that the industry is here to stay, they hope, on these waters, and 4) to try to work out a program that is going to satisfy all of you.

MR. ATKISSON: I don't quarrel with that, Mr. Stein. I wish to make the point very clear, however, that even if you could by some mysterious route indemnify the fishermen for the dollars loss mentioned in the preconference report that would in no way satisfy the public. That was the sole reason.

CHAIRMAN STEIN: I don't want to get into a philosophic argument. I don't believe that we in government are going to start a practice to indemnify the fishermen and run them out of business, nor to indemnify the suburban housewife and children and say "Don't go swimming." We have to provide the

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fullness of life and water uses for all these people. The job is not keeping them out of the water; the job is expanding the water uses.

Again I ask you -- and I know what the problem is -- but don't deprecate this record. I think we have a tremendous record. Let me say this one additional thing before closing, sir: If you want to get all of these points of view and information from the industry, from the State, from the Federal Government and from the fishermen, you just have to recognize in a free society that you have to take their activities along with it. We have obtained their views and information.

MR. ATKISSON: It was in that spirit I offered my comments, Mr. Chairman. (Applause.)

CHAIRMAN STEIN: It's 5 minutes after 5:00.

MR. YANTIS: Is G. N. McNair here?

(No response.)

Shelby Bryan? (No response.)

Ben Nelson? (No response.)

Alvin Otter? (No response.)

I think they have all gone, but they might come back.

Mrs. Sharron Stewart, you can testify if it doesn't take too long.

MRS. STEWART: I would rather not.

MR. YANTIS: Vaughn Stewart?

MRS. STEWART: He is not here either.

MR. YANTIS: Are you all in the same family?

MRS. STEWART: Yes.

MR. YANTIS: Sam Peck? (No response.)

Victor Emanuel?

MR. EMANUEL: My statement will take at least 20 minutes. I will wait until tomorrow morning.

MR. YANTIS: Jim Ragland? (No response.)

Well, at this point, I believe -- Gerald Hopkins, is he here?

I think that it might be best then to count on the rest of them being heard tomorrow, but we will start in the morning with Walter Quebedeaux. So, those of you who expect to speak will be delayed for some little time. He has a very lengthy statement. I am sure he would like to have you here, but don't come expecting to speak shortly after 9:30.

Do you want to try for 9:30 again in the morning?

CHAIRMAN STEIN: We will try for 9:30

I would hope we can finish the public statements tomorrow, because it would be very difficult going through the weekend. My experience is that if you break this into 2 sessions, you are not going to be as effective or have a good record as if we do it in one continuous session.

MR. YANTIS: One point I forgot: where do we meet tomorrow?

CHAIRMAN STEIN: We are going to meet in that very large room downstairs, the Crystal Ball Room. I guess we will be rattling around like peas, but we will welcome you all at 9:30.

(Whereupon, the conference adjourned until 9:30 a.m.)